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Shot-Peening Aluminum Forgings

Details of a Relatively New Application of Shot-Peening that has been Adopted by the Pratt & Whitney Aircraft Division of United Aircraft Corporation for Strengthening Aluminum-Alloy Pistons and Crankcase Sections

By CHARLES H. WICK

SHOT-PEENING, which has been so effective in increasing the fatigue strength of steel parts, is now being applied to aluminum-alloy aircraft-engine components by Pratt & Whitney Aircraft Division of United Aircraft Corporation, East Hartford, Conn. This method of increasing the service life of its products has been applied to both aluminum-alloy pistons and crankcase sections, as well as to many steel aircraft engine parts. Shot-peening of magnesium alloys has been experimented with by Pratt & Whitney, but it is not being used in production, chiefly because of the fire hazard involved.

Shot-peening, which is simply controlled cold-working, has practically the same effect on aluminum alloys as on steel. The shower of round metallic shot acts as tiny ball peen hammers, slightly stretching the surface of the metal and

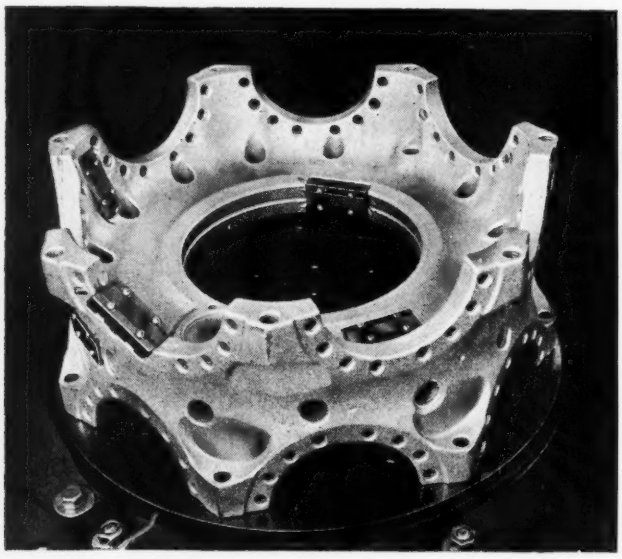

Fig. 1. "Dummy" Aircraft-engine Crankcase Section that Holds Five Test Strips for Checking Intensity of a Shot-peening Operation

the layers of metal for a short distance below the surface. This cold-working permits the surface metal to resist fracture more effectively by reorientation of its grain structure. Also, the residual stresses in the surface layers tend to offset any stress applied to the part. Shot-peening provides the strongest possible part with a minimum weight—a prerequisite for members of aircraft engines.

Close control of the peening operation and accurate interpretation of the results obtained necessitate highly trained personnel. Beyond a certain intensity, peening weakens the resistance of the part to repeated stress. This effect of over-peening is probably due to weakening of the metal by so stretching the surface that its ductility is reduced and cracks start in the peened surface or just below the peened skin.

The shot used to peen aluminum is softer than that required for steel, since it need only be harder than the material to be peened. A soft, annealed, malleable-iron shot is employed for peening of all aluminum alloys. The hardness of the shot is kept between Vickers 250 and 350.

SAE specifications for shot size have recently been revised to increase the permissible variation in the diameter of each shot for a specified size. Formerly identified by a P number, the sizes are now given an S number. SAE No. S-170 shot, having a nominal diameter of 0.017 inch, is used to peen aluminum-alloy pistons, and S-390, having a mean diameter of 0.039 inch, is used to peen crankcase sections. It is essential to use shot smaller in radius than the radius of the smallest fillet on the part being peened. The size of shot affects the depth of peening. A visual classifier, in which the shot automatically grades itself, is periodically used to check the size of shot. The ultimate peening intensity cannot be maintained with shot of non-uniform size.

To prevent broken shot from being recirculated, a separator is an essential of the shot-peening equipment. New shot, to replenish that removed by the separator, is automatically added when required. Approximately 30,000 pounds of shot are needed per hour for the crankcase peening operation. Shot particles that are broken or too fine are detrimental. Cracked shot will act as an abrasive and cut the work. It is important to note that both the part to be peened and the shot should be kept dry, clean, and free

Fig. 2. Mating Faces of All Crankcase Sections are Masked by High-speed Steel Rings to Protect Those Surfaces during Peening

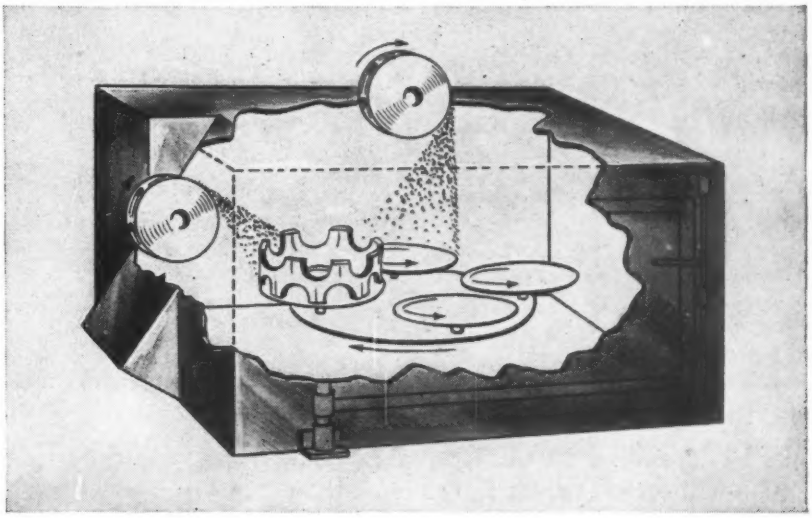

Fig. 3. Cutaway View of Peening Machine, Showing the Two Vertical Rotating Wheels That Throw a Shower of Shot on the Parts being Peened

from oil or grease to insure that the shot will flow freely through the machine.

Peening intensity is measured by arc height, indicated on the No. 2 gage developed by J. O. Almen, of the General Motors Laboratories. Steel test strips, measuring 3 inches long by 3/4 inch wide by 0.050 inch thick and having a hardness of between 44 and 50 Rockwell C, are held in hard steel blocks by means of four screws. The holders, with the strips, are positioned at critical points in a "dummy" part, and the part is passed through the peening machine.

When a test strip has been shot-peened, it assumes a curved shape, with the convex surface on the peened side. The curved strip is placed in the gage, and a dial indicator is used to read the arc height over a chordal length of 1.25 inches on the concave or non-peened side of the test strip. Should the arc height not be within the specified range, a change in air pressure or wheel

Fig. 4. Four Crankcase Sections are Peened Simultaneously on This Machine. Each Section is Rotated by the Auxiliary Table on which it is Held

Fig. 5. Certain Localized Peening Operations are Performed by Directing the Stream of Shot Manually onto the Desired Area of the Work

speed—depending on the type of machine being used—will often correct the arc height.

Correct peening intensity depends on the alloy to be peened and the amount and type of stresses that the part will be subjected to in service. Observation of parts in actual service and laboratory tests are the only means at present of determining the intensity to use for any specific part and application.

Peening intensity, or the arc height by which it is gaged, increases with the time of peening or amount of shot applied until a certain point is reached where further peening will not greatly increase the intensity. This is called the saturation intensity. The minimum time of peening at which this point occurs is used as the cycle time for all peening operations at Pratt & Whitney Aircraft. Thus, the peening of the sides of pistons or crankcase sections twice—caused by the necessity of turning the parts and passing them through the machine a second time—does not cause over-peening of the work.

The stresses induced in aluminum-alloy parts by peening are completely lost when the part is heated to 500 degrees F. However, since the crankcase and pistons do not exceed a temperature of 400 degrees F. during service, only a small percentage of the stresses is lost.

Crankcase sections of Pratt & Whitney aircraft engines, forged from Aircraft Material Specification 4125 aluminum alloy, are shot-peened to increase their strength and also to arrest galling which might occur directly under the steel liners applied to their main bores. The front, front center, center, rear center, and rear sections, which comprise the crankcase of the four-row, 3000-H.P., Pratt & Whitney R-4360 engine, are subjected to sixteen peening operations. Each operation requires that the section be run through the machine twice, the part being turned 180 degrees between runs to insure peening of all surfaces necessary.

An arc height of from 0.012 to 0.017 inch, measured on an Almen No. 2 gage, is maintained for these peening operations. The peening intensity is checked by placing five standard test strips, mounted on blocks, in a scrap crankcase section, as shown in Fig. 1. This "dummy" is passed through the peening machine every four hours to simulate actual operating conditions.

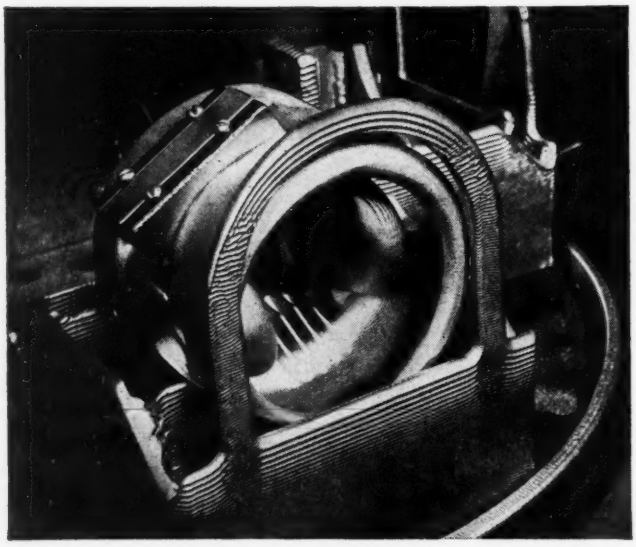

Fig. 6. A Scrap Aircraft Engine Piston is Used to Hold a Test Strip, Thus Simulating Actual Operating Conditions in Determining Peening Intensity

The production set-up for peening crankcases, shown in the heading illustration, permits the completion of ten engines, representing a total of fifty crankcases for the larger engines, per eight-hour shift. The U-shaped, roller type conveyor seen directly behind the forgings in the foreground, facilitates masking, feeding to the peening machine, unmasking, and inspection.

The workmen along the right-hand side of the conveyor mask the crankcase sections to protect those surfaces that are not to be peened, as the parts advance toward the peening machine shown in the background. The mating faces of the crankcase sections are masked with high-speed steel rings, as shown in Fig. 2, for all peening operations. Seen in the center of this crankcase section is the steel plate used to mask the main bore of the section during the peening operation.

An airless machine is used for most peening operations on the aluminum-alloy crankcase sections. This custom-built, swing-table type machine contains two vertical wheels that revolve at 1800 R.P.M., throwing showers of shot from their vanes against the surfaces to be peened, as shown in Fig. 3. The top wheel is located approximately 19 inches from the work, and the side wheel about 14 inches.

The main table of the machine, which is 6 feet in diameter, revolves at 5 R.P.M. and is provided with four auxiliary tables. Each auxiliary table, approximately 24 inches in diameter, carries a crankcase section and is rotated at 45 R.P.M. A variable drive permits changing the speed of the main or auxiliary tables. When four sections have been loaded on the tables, as shown in Fig. 4, the door, to which the tables are connected, is swung shut and the automatic peening cycle of three minutes minimum is begun.

At the completion of this cycle, the door is opened and the crankcase sections are turned upside down, after which the operation is repeated. Then the peened parts are lifted back cnto the conveyor. Here the men shown at the left in the heading illustration remove the masks from the parts and inspect the sections visually to insure complete coverage of the shot-peened areas.

Connected with this special peening machine, and using the same shot supply system, is a hand cabinet used for localized peening operations. In this cabinet, the shot is forced by compressed air through a rubber hose, thus directing a concentrated spray of shot on specific areas, as shown in Fig. 5. This equipment is used to peen the oil-pump bores in the crankcase sections after

Fig. 7. Semi-finish-machined Aircraft-engine Piston at Left is Peened Both Inside and Outside, except for Skirt End, as Shown at Center. Finish-machined Piston is Shown at Right

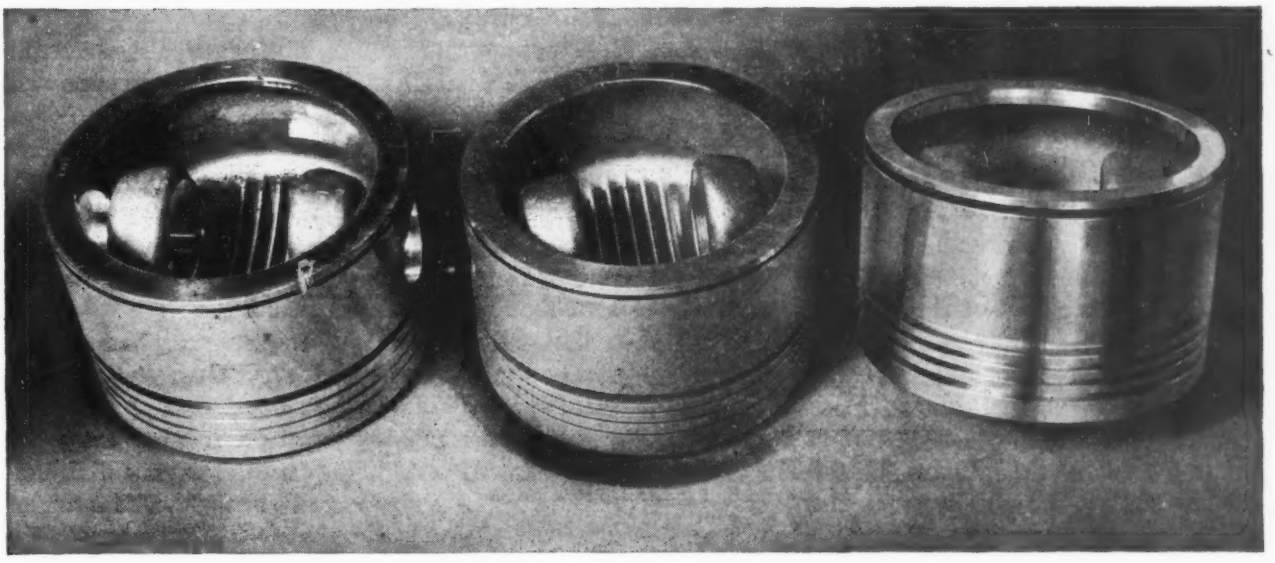

Fig. 8. End of Piston Skirt is Protected during Shot-peening Operation by Snapping a Hard, Molded Rubber Ring over it

the steel liners have been assembled and ground in the main bores. This insures maintaining the close tolerances required in the relation between the oil-pump bore and the finished crankcase bore. The oil-pump bore is machined under size, and the peening operation brings it to the required size. Also, the main bores of front and rear crankcase sections, which are not fitted with steel liners, are peened in this hand cabinet.

The front and rear section forgings of the engine are peened before machining, as some distortion has been encountered when these sections are peened after machining. The front center, center, and rear center sections are peened after they have been rough-machined. From 0.003 to 0.010 inch is removed from the main bearing bores of these sections in finish-machining, prior to the assembly of the steel liners. However, since the depth of penetration with the peening intensity used is 0.025 inch, not less than 60 per cent of the residual stresses remain in these surfaces. A minimum of 0.0003 inch is allowed for all fits and tolerances to take care of any change in dimensions caused by the peening operation.

Forged pistons, of Aircraft Material Specification 4230 aluminum alloy, are also shot-peened to increase their strength. This treatment minimizes the possibility of cracks forming between the piston-ring grooves and the fillets in the bore of the piston skirt. Also, the dome of the piston is strengthened, thus preventing the formation of cracks from detonation when the piston is installed in the aircraft-engine cylinder.

Arc heights of from 0.008 to 0.013 inch are specified for the peening of pistons. A single test strip, mounted on a block in the lower groove of a scrap piston, as shown in Fig. 6, is checked every four hours to insure maintaining this intensity.

The piston is semi-finish-turned, the wrist-pin holes are semi-finish-bored, the ring grooves are rough-formed, and the bore of the piston is finish-burred, as shown at the left in Fig. 7, before peening. Such machining before peening simplifies masking, it only being necessary to snap a hard, molded rubber ring around the lower end of the piston skirt, as seen in Fig. 8, to protect that surface from peening.

The entire piston, with the exception of the masked portion of the skirt, is then peened, both inside and out. The appearance of the part at the completion of this operation is shown at the center in Fig. 7. The piston is then finish-machined to the form seen at the right. All exterior surfaces of the piston are finished, except the

lower ring groove, where it is desired to retain all residual stresses from the peening operation, because this groove is nearest the fillet in the bore of the piston, and hence more subject to the formation of cracks. Since this ring groove is not finished, 0.0002 inch is allowed in the rough-machining operation for an increase in the finished width of the groove due to peening.

For peening aluminum-alloy pistons, an airless machine is used. This machine has a single wheel that is rotated at 2250 R.P.M., throwing the shot approximately 16 1/2 inches onto the pistons. The main table of the machine, which is 6 feet in diameter, makes ten revolutions per hour. It is equipped with six auxiliary tables that each hold four pistons, as shown in Fig. 9, and rotate at 45 R.P.M.. As the peening covers only half of the inside and half of the outside of each piston, the pistons must be turned through an angle of 180 degrees, and passed through the machine again. The production rate is 120 pistons per hour.

Following the peening operation, the pistons are washed, immersed in a corrosion preventive compound, and inspected. Sharp edges and tool marks are causes for rejection. Slightly rolled edges are not objectionable if rolled away from the tension surface of the part. Dark areas or pock marks on the surface of the forging must be completely peened.

Experience with the various types of shot-peening equipment at Pratt & Whitney has led to the following conclusions: Airless machines, employing a wheel to throw the shot, give a greater spread of shot, covering a larger area—a definite advantage for large parts to which it can be adapted. Since the speed of the wheel is constant, the velocity of the shot is uniform, and therefore a uniform coverage of the work is obtained. The disadvantages of this type of machine are that the blades of the wheel need to be inspected every four hours, the blades are difficult to replace, and the wheel can be set to peen in only one direction at a time.

With air-operated peening equipment, the threaded nozzles used are easy to replace, and need be inspected only every fifty hours. Adjustments of this type of equipment permit more effective coverage of varying angles. Although the air-peening method does not cover as much area, this is an advantage for localized operations such as described in connection with the peening of the crankcase sections. A disadvantage of this type of equipment is that there is more wear of connecting members, such as steel pipes, rubber hose, etc.

Fig. 9. Six Auxiliary Tables on the Main Table of This Airless Shot-peening Machine Hold Twenty-four Pistons, and Enable a Production Rate of 120 Pistons per Hour to be Attained

Cutting Costs with H

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PRODUCTION executives of shops in which portable tools are used are not only aware of the cost of portable tool operations, but also of the fact that these costs appear to be steadily rising on account of periodic wage increases. Today a portable tool operator earns $40 to $48 weekly, and even if only half his time is devoted to portable tool operations, the cost is $20 to $24 a week plus the overhead necessary to provide him with facilities for work, including power and installation costs.

The output per man per hour depends largely on the efficiency of the portable tool equipment. If the equipment has plenty of power, high load speed, light weight, and is the correct type for the particular operations involved, production will be good. If the equipment is less than modern, the output naturally will be low and operation cost high. The problems of the portable tool user and the opportunities for cutting costs presented by high-cycle electric portable tools will be discussed in this article.

High-cycle electric tools are operated by three-phase electric current of 220 volts and 180 cycles per second. This high-frequency current is converted from the usual electrical supply by a motor-generator, shown in Fig. 1, in the case of direct current or by a frequency converter when alternating current is the supply. The motor in the portable tool itself is a squirrel-cage induction type, the speed of which is governed by the frequency of the power supply—that is, 180 cycles. This high-cycle motor develops a rotor speed of 10,800 R.P.M. when wound for two poles. In such a motor, the current flows only through the stator, since in high-cycle motors there are no electrical connections between the stator and the rotor, and there are no commutators or brushes. The relatively high frequency of 180 cycles produces exceptional power in light-weight tools.

Actually, an induction motor of a given mass develops three times as much power when driven by 180-cycle current as when driven by 60-cycle current. Moreover, this high power is maintained throughout the life of the tool because there are no sliding, metal-to-metal parts in the motor which might wear and gradually reduce the efficiency. Experience has shown that high-cycle tools have a long life, and that during this life efficiency is maintained at a high level.

Another operating characteristic of the high-cycle motor is its substantially high speed under load. Well designed high-cycle tools maintain approximately 95 per cent of their free speed at their rated power. This high speed under load, supported by a corresponding high torque at high speed, drives cutting tools with maximum effect. The weight of the tools is substantially reduced through the use of magnesium parts, the weight being about the same as that of modern air-driven tools in the larger sizes, although somewhat greater in the smaller sizes than corresponding air tools.

Investment and Operating Costs of High-Cycle Tools

The actual cost of supplying power to high-cycle tools through a frequency changer is exceptionally low. In the case of a small installation, say ten to fifteen tools, the saving in power costs over some other types of portable tools will

h High-Cycle Electric Portable Tools

Advantages Derived from the Use of High-Cycle Electric Portable Tools and Typical Applications on Different Classes of Work

alone pay for the complete installation of the high-cycle supply unit in one to one and a half years, depending on the unit of power costs. With larger initial installations, the time for repayment of the investment is reduced.

An additional saving is obtained in the cost of installation, because the first cost of a motor-generator or frequency converter in the average small installation of high-cycle tools is comparatively low. In an initial installation, it is generally the practice to provide a unit of larger size than actually required because a 20-kilowatt frequency converter, for example, while double the size of a 10-kilowatt converter, costs only about 40 per cent more. Thus it is possible to install a larger size and anticipate future requirements at low expense, although additional high-cycle power supply units can usually be easily installed adjacent to present units.

When a steel plant required new equipment in its bar-mill inspection department for operating a minimum of twenty-one 8-inch grinders, study of the problem showed that if high-cycle tools were used, two 10-kilowatt motor-generators, such as seen in the background of Fig. 2, would be needed, costing, complete, the comparatively small sum of $2800. These motor-generator sets required a total of only 30 H.P. Two motor-generator sets were installed, as shown. Later two more sets of the same capacity were added, as well as two 20-kilowatt sets to supply current for an additional sixty-six 8-inch high-cycle grinders.

Maintenance costs of high-cycle portable tools are low, since these tools contain no sliding, metal-to-metal parts, pistons, toggles, commutators, or brushes, and the tools are mechanically simple. Periodic inspection and lubrication will keep high-cycle tools at high efficiency.

When the voltage obtained from power supply companies is substantially uniform, a frequency changer should generally be used to obtain current of 180 cycles. This consists of a special wound-rotor induction motor, driven as a generator by a squirrel-cage induction motor, or in the larger sizes, by a synchronous motor. These sets are available in two and four bearing types, and usually operate at 1800 R.P.M.

When serious voltage variations occur in incoming power lines, a motor-generator should be

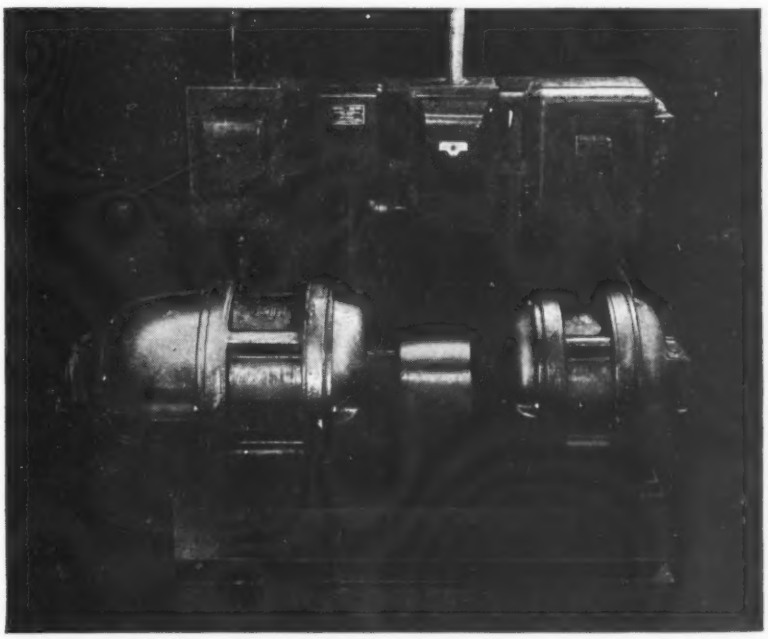


Fig. 1. Motor-generator for Converting the Regular Electrical Current Supplied to an Industrial Plant into High-frequency Current

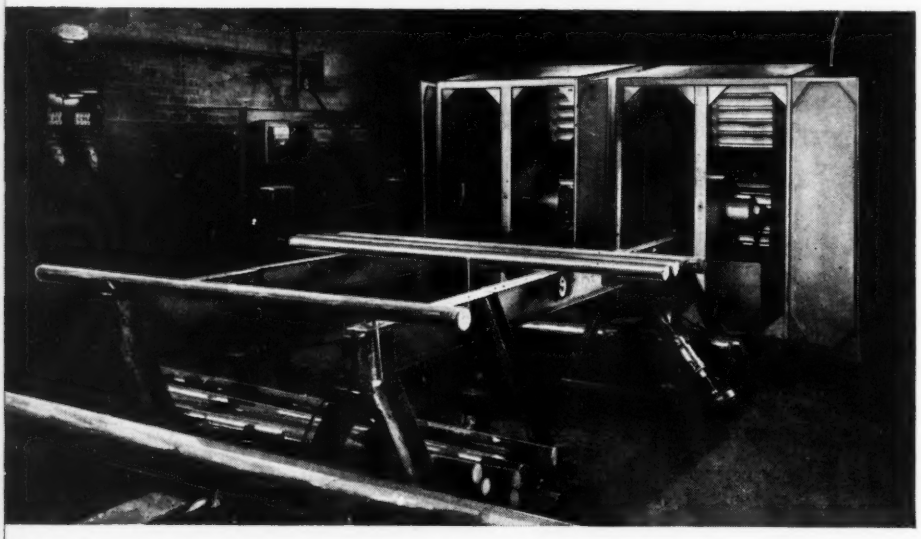


Fig. 2. Grinding Room in Inspection Department of a Steel Mill, which is Equipped with High-cycle Electric Portable Tools

used. This consists of a 180-cycle generator driven either by a squirrel-cage induction motor, a synchronous motor in the larger sizes, or a direct-current motor. With a motor-generator, the high-cycle voltage is free from variations due to fluctuations in the power supply voltage, and can be regulated manually or automatically to maintain the desired voltage for the high-cycle tools. Also, the power factor in the high-cycle tools is not transmitted to the power line. In general, the cost of a motor-generator is somewhat higher than that of a frequency converter, and the majority of installations include a frequency converter.

High production is obviously obtainable with high-cycle portable tools because of their operating speed. For example, in a sheet-metal fabricating shop, high-cycle sanders installed for smoothing down welds operated at a sustained load speed of 4600 R.P.M. The tools were easy to handle because they weighed only 16 pounds. Output was doubled over the production obtained with previous equipment, and costs reduced 50 per cent.

In another shop where portable tools were used for cleaning operations on structural steel, high-cycle tools operating at 10,800 R.P.M. and using 2 3/4-inch cone wheels were adopted, with an increased grinding output of 200 per cent.

Selecting the Right Tool for the Job

Costs can often be cut by a careful analysis of portable tool operations which, in themselves, appear rather simple. In a gray iron foundry that specializes in producing truck-engine cylinder blocks, high-cycle grinders operating at 5600 R.P.M. with 6-inch elastic bonded wheels were formerly used. The bearing locations in the crankcase parting lines were difficult to reach

Fig. 3. High-frequency Electric Portable Tools being Employed in the Steel-mill Inspection Department for Checking Quality of Rolled Steel Bars

with these tools. Consequently, a high-cycle grinder running at 4400 R.P.M. and suitable for 8-inch wheels, as seen in Fig. 5, was substituted, with a resulting cost reduction per piece of 20 per cent. The operator could reach the bearing spots, and the work was easier.

The portable tool equipment of many shops is not sufficiently diversified to enable operators to select tools for specific operations which run at the most desirable speeds or have the most suitable horsepower capacity. For example, cone-shaped grinding wheels 2 3/4 inches in diameter are frequently found being used at the same speed as that suitable for a 6-inch wheel—namely, 6000 R.P.M. The smaller sized wheel apparently cuts well, but if a portable tool running at 10,800 R.P.M. and equipped with a 3-inch elastic cup-wheel were used instead, the operation would be speeded up amazingly, wheel life lengthened, and the work finish improved.

The use of a 15- or 27-inch extension will often enable an operator to work efficiently in places that are difficult to reach. Likewise, the use of a right-angle grinder equipped with a 4- or 6-inch cup-wheel instead of a straight-in-line tool fitted with a 6- or 8-inch straight grinding wheel will frequently result in a substantial production increase.

Determining Costs of High-Cycle Electric Tools

In determining the operating, production, and investment costs of high-cycle electric tools in a specific situation, the number of tools should be decided upon and a calculation made of the probable current consumption. The size of frequency changer or motor-generator required for the installation should be determined and cost figures obtained. Finally, the operation cost of the frequency changer or motor-generator should be analyzed.

* * *

One-sixth of the patents issued in the United States deal with the design, manufacture, or repair of motor vehicles and accessories; with lubricants and fuels for their operation; or with special machines and processes for making them.

Fig. 4. Employing a High-frequency Portable Electric Tool Equipped with a Cone-shaped Grinding Wheel for Smoothing Flame-cut Holes in Sheet Steel

Fig. 5. Using a High-cycle Electric Tool Equipped with an 8-inch Straight Wheel for Grinding the Parting Line of a Motor-block Casting

Machining Ford Carburetor

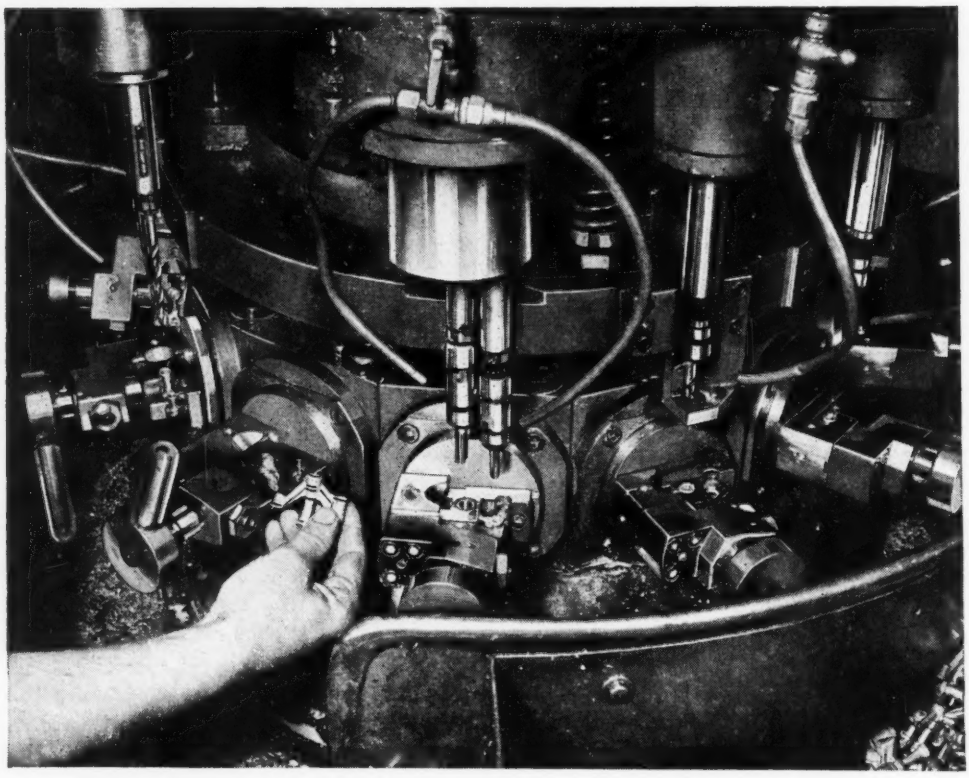


Fig. 1. Close-up View of a Drilling Machine, Showing the Operator Placing a Die-casting in One of the Twelve Fixtures, which Index about the Vertical Axis of the Machine

ALTHOUGH the zinc-alloy die-castings used in the Ford carburetors are cast to within plus or minus 0.003 inch on most dimensions, and with most holes cored, as described in the article entitled "High Production of Carburetor Die-Castings," published in the July number of MACHINERY, they require some light machining operations. The machining set-ups and the fixtures employed for this purpose at the Milford, Mich., plant of the Ford Motor Co. are designed to insure both rapidity of operation and accuracy of the work.

Except for the carburetor bowl and air horn, the die-cast components are small. Some of them require drilling from several angles, and in certain instances, spot-facing, reaming, and tapping. The operations are performed in some cases on machines designed especially for the job, and in others, on machines adapted for semi-automatic operation, with only loading and unloading done by hand.

Among the most interesting operations are those performed on the nozzle bar, as shown in Figs. 1 to 4, inclusive. These die-castings, made in rights and lefts, measure approximately 2 by 1 3/8 by 1/2 inch. There are cored axial holes in the central stem and in the tubular portion of the branch arm, but all other holes are too small to core. All but one of these holes are at odd angles to the axis of the nozzle bar. The holes through the angular connecting tubes are deep in relation to their diameter, and flat-faced gun drills are used to produce them.

For the initial set-up, a Morris drilling machine, Fig. 1, having a turret that indexes about a vertical axis, is used. There are twelve stations around the turret, and a quick-clamping fixture is used at each station. These fixtures are so made that each can be rocked automatically about a horizontal axis, radial to the turret axis. This permits odd-angle operations to be performed while the drilling spindles remain in a vertical position. It also permits working from both ends of the piece, as the fixtures can be turned through a full circle.

At the loading station of this machine, the work is clamped manually in a holder with its large end up and its central axis in a vertical position. Thereafter, the casting is not touched until the same fixture, after indexing through the eleven other stations, returns to the first position for unloading.

Die-Castings

By HERBERT CHASE

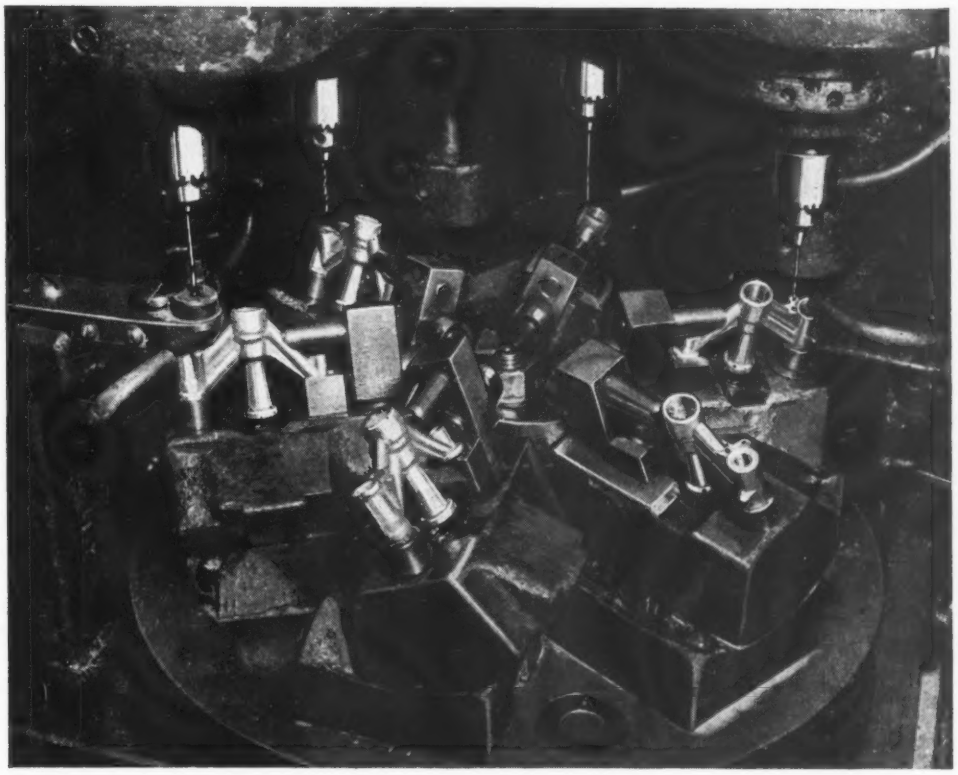


Fig. 2. Dial Type Indexing Fixture with Adjustment for Rocking Carburetor Nozzle-bar Castings to the Required Angular Positions for Four Different Drilling Operations

At the first work station, adjacent to the loading station, the central hole is drilled for subsequent tapping, and is chamfered. When indexed again, the fixture is automatically rocked to permit drilling one of the long angular holes through a side arm. Later operations include drilling holes to be tapped, spot-facing the center tube and ends of both side arms, drilling two No. 41 angular holes, drilling and reaming air bleed holes, and reaming the 0.116-inch diameter central hole. Tapping of a No. 8–32 and a 1/4–32 hole with a two-spindle head is done at the final work station.

Gun drills are used in the smaller diameter, longer holes, partly because these drills leave little or no burr and produce straight, clean holes. Three of these machines, all similarly tooled, are used for performing the operations just described, and each machine produces 250 pieces an hour.

Other operations on the nozzle bars are performed by means of the set-up shown in Fig. 2. Here four small holes are drilled at odd angles, one at each of four stations. The other two stations on this dial type fixture are for loading and unloading. Clamping is done automatically

Fig. 3. Drills are Automatically Fed and Retracted, One at a Time, to Prevent Interference in the Angular Drilling of This Small Carburetor Nozzle-bar Die-casting

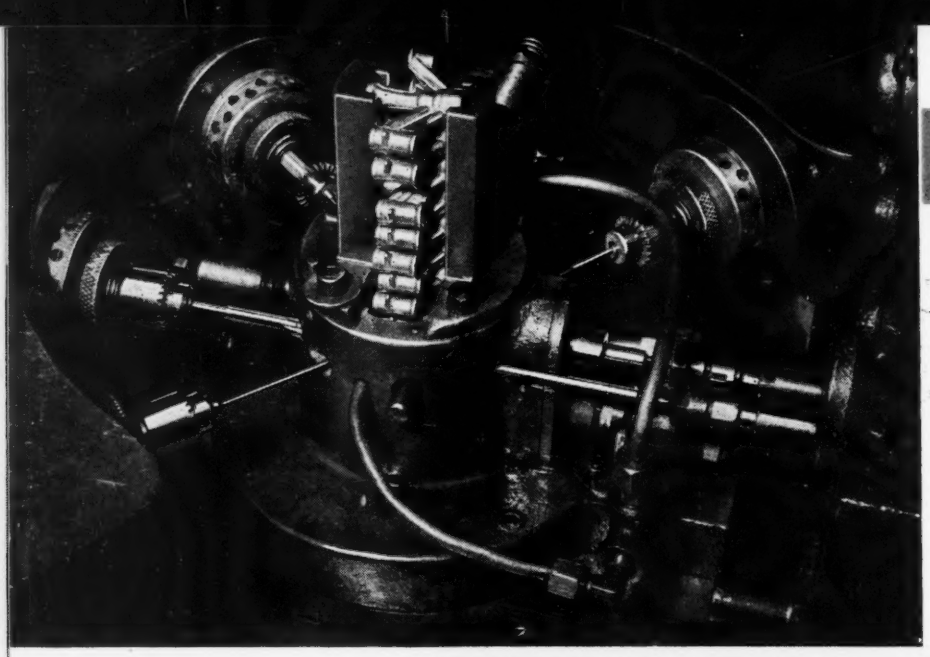


Fig. 4. Magazine Feed Permits Three Reamers and Four Drills to Automatically Machine These Zinc-alloy Die-castings at the Rate of 500 per Hour

Fig. 5. (Right) Set-up for Drilling Four Cross-holes, Spot-facing the Lower End, and Reaming the Central Hole in Carburetor Economizer Bodies

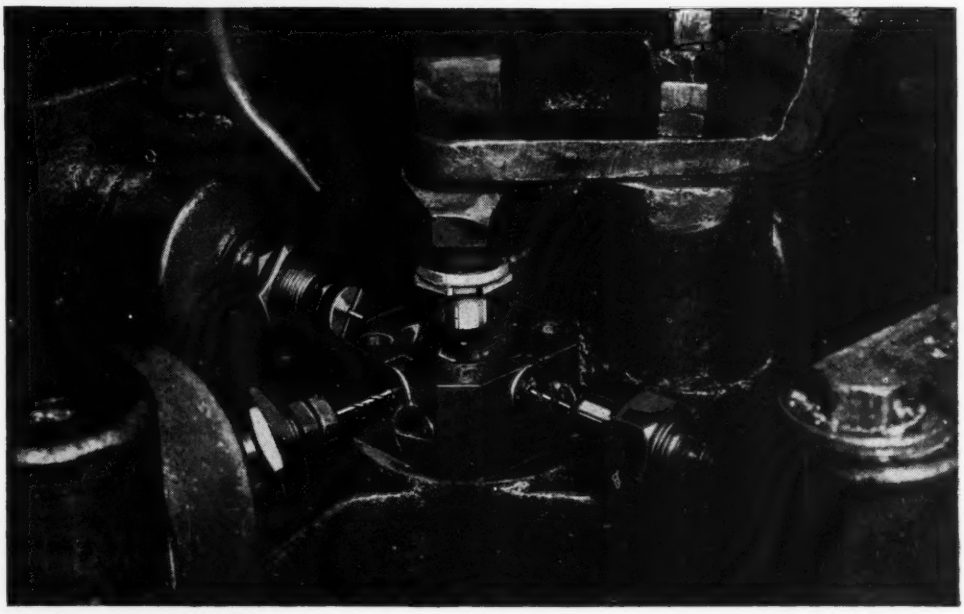
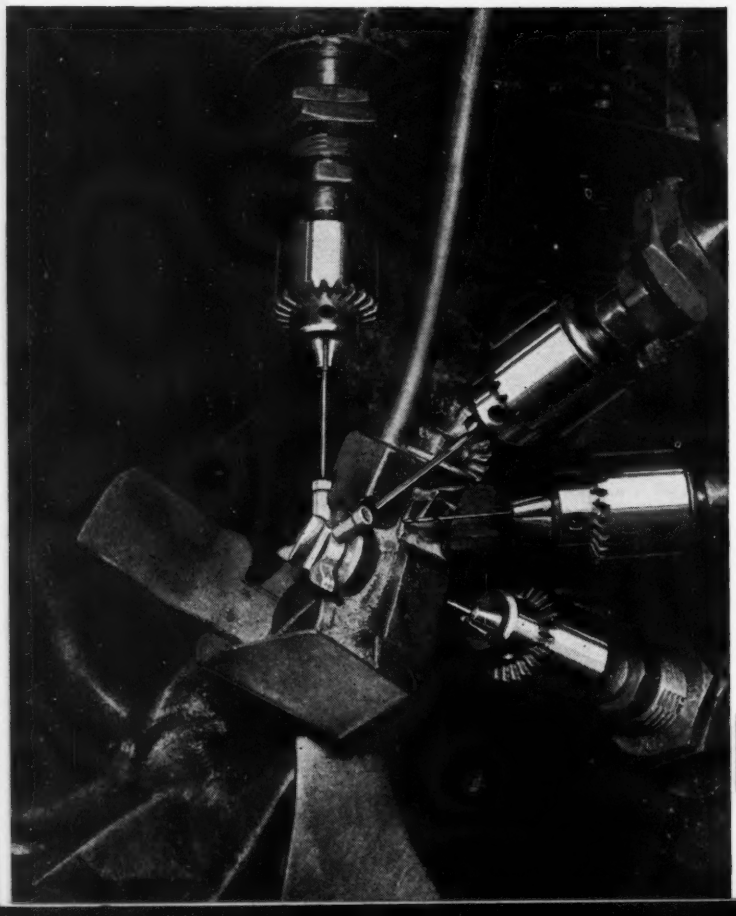


Fig. 6. (Below) Several Flat-face Gun Drills are Used for Machining the Deeper Holes in This Multiple Drilling Operation on Zinc-alloy Die-castings



against flat surfaces that were spot-faced in the set-up shown in Fig. 1. Each of the six fixtures on the dial has a turned bottom face that mates with a similar cylindrical surface. Rollers at the rear of each fixture travel on a circular cam track that rocks the fixture to the correct angles for loading, for the various drilling operations, and for unloading.

All operations in this set-up are for small holes adjacent to the secondary tube, and all drills are automatically fed and retracted after the fixture indexes. The operator need only load and unload the castings.

Other angular drilling operations are performed on the nozzle-bar casting while it is held in the fixture shown in Fig. 3. In this case also, the drills feed and retract automatically; only one drill operates at a time, so that the drills do not interfere with each other.

For semi-automatic burring of the nozzle bars, the special machine shown in Fig. 4 is used. It applies three reamers and four drills to the parts. In this set-up, the operator need only load the parts into the magazine, down which they are fed automatically. The drilling heads feed and retract the tools automatically in a cycle which is so controlled that there is no interference between any of the tools. After the cycle is completed, the casting is dropped automatically into a tote box below the machine. Another part then falls into position from the magazine and is clamped before the tools are again advanced. This set-up permits handling 500 castings per hour per machine.

Another of the small carburetor castings has four radial holes drilled simultaneously in it by means of the set-up shown in Fig. 5. The part, shown directly above the fixture, is lowered into the fixture by hand. In the same setting, the bottom shank of the part is spot-faced and a reamer located on a spindle above the work is lowered to remove burrs formed in the central hole by the four cross drills.

Most of the drilling required on the small discharge nozzle casting is performed with the set-up shown in Fig. 6, in which the longer holes are finished with gun drills. The tools used in this operation include two No. 69 and two 0.050-inch diameter drills and one 0.060-inch diameter drill. All are fed automatically and separately to avoid interference, while the work is positioned on a hub-like projection from its back face.

Much of the machining of the air-horn casting is accomplished in the three-way set-up shown in Fig. 8. The work is held against an angular bracket fixture. Tools that enter the part from the top and left drill, ream, and spot-face the work. A cutter advanced from the right machines the inside taper and faces the end of the casting. Parts are finished at the rate of 250 an hour in this operation. Somewhat similar set-ups are used for most of the machining on the carburetor bowl casting.

Although the assembly lines are well mechanized, a large proportion of the operations are done by conventional means, including the driving of screws with high-cycle electric tools. An exception is the use of a special bench around which a chain carries a series of fixtures for the

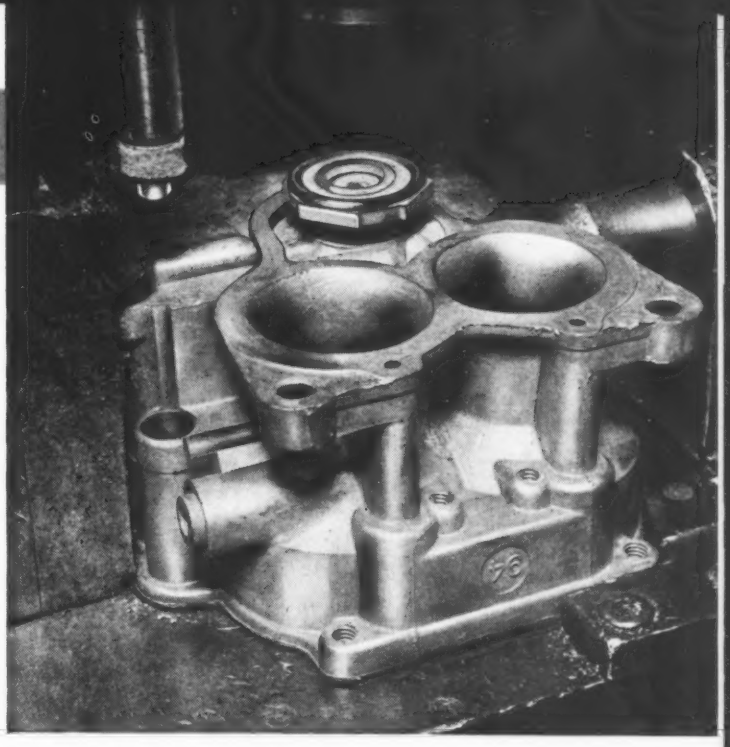


Fig. 7. Access Holes in the Carburetor Body Casting are Plugged with Lead Shot and a Brass and Felt Washer is Applied to Another Hole in This Set-up

Fig. 8. Three-way Set-up for Drilling, Reaming, Spot-facing, and Boring the Carburetor Air-horn Casting

assembly of economizers. Operators drop the various components into place as the fixtures are indexed around the bench by a link conveyor.

Except for the die-cast body, most of the parts in the economizer assembly are blanked from sheet material. The threaded stem of the economizer is a brass screw-machine product. At the first station, the end of the stem is riveted to a washer by means of a pneumatic hammer. At the next station, the fixture is indexed to a position under a rotating drill spindle that carries a tool equipped with rollers to spin the thin edge of the economizer body inward, thereby fastening the washer inside the body recess and completing the assembly.

Certain of the holes cored in the carburetor bowl casting are provided only because it is necessary to insert tools through these holes to reach other holes in an interior wall. After the tools have been used, such access holes are plugged, as seen in Fig. 7. The body casting is tightened in the fixture and a punch is employed to press lead shot into place and expand the shot enough to seal the hole permanently. In the same fixture, an air hammer is used to apply a felt ring, backed by a brass washer, to another hole. The ring and washer are placed over a tool held in the hammer, and when air is applied, the tool turns down enough metal around the edge of the hole to fasten the washer. While still in this fixture, an economizer, assembled as described above, is screwed into a tapped hole in the body casting and tightened by means of a high-cycle wrench.

Wider Applications for Titanium and Molybdenum in Industrial and Construction Fields

TWO metals, both of which have been infrequently applied because of the difficulty of producing them in quantity, may soon be more widely used in the industrial and construction fields. These metals are titanium and molybdenum.

Titanium can now be obtained in relatively large amounts by a process developed by the United States Bureau of Mines, which consists of reducing titanium tetrachloride with pure molten magnesium in the presence of helium gas under pressure. The resultant metal, about twice the weight of magnesium, but considerably lighter than steel, has physical properties approaching those of stainless steel. It probably will be used where its light weight and high strength compensate for its increased cost.

The advantage of molybdenum is that it has an exceptionally high melting point. Until recently, however, it has not been available in ingot sizes over approximately 1 1/2 pounds. It was also restricted as to shape, wire and rectangular pieces being the only ones that could be made on a commercial basis. New manufacturing methods developed by Westinghouse engineers have eliminated both of these restrictions; ingots weighing 250 pounds are now being made, and cylinders, tubes, disks, squares, and other shapes are being produced in diameters up to 7 inches and in lengths up to 30 inches.

It is expected that molybdenum will be used for heating elements for ultra high-temperature electric furnaces without element protection; for blades, nozzles, and firing chambers of gas turbines and rockets; for die-casting dies for brass and other alloys melting at relatively high temperatures; for metal-working tools and cutters; for hot-pressing, drawing, and extrusion dies; and similar applications.

* * *

Attendance at Machine Tool Show Far Exceeded Expectations

The total attendance at the 1947 Machine Tool Show, staged at the Dodge-Chicago plant under the auspices of the National Machine Tool Builders' Association, was 175,827. All told, 2021 machines were displayed in operation. The aggregate value of the machines on display was $20,000,000. Some of them weighed as much as 60 tons.

Cooperation of Labor Essential to Lower Living Costs

THE United States today is an isle of productivity in a sea of non-productivity. Most of the other industrial nations are at a low production ebb, and as a result, their people are just about managing to survive. In some of the war-torn countries, facilities no longer exist for substantial production, and in others, the inclination for hard work seems to have lessened since pre-war years.

American industry performed an extraordinary feat in changing over from wartime production to peacetime manufacture without any appreciable disruption in employment. Contrary to the predictions of some economists, employment did not fall off any considerable amount during the reconversion period. Today, even though industry has had to absorb millions of home-coming veterans, the percentage of unemployment is extremely low. As production requirements increase, there may actually be a labor shortage.

Only a nation operating on the free-enterprise system could achieve such a noteworthy record. But there is one penalty that we are paying for freedom of business and freedom of labor—that is exorbitant prices. The cost of manufacturing must come down if we are to avoid ruinous inflation.

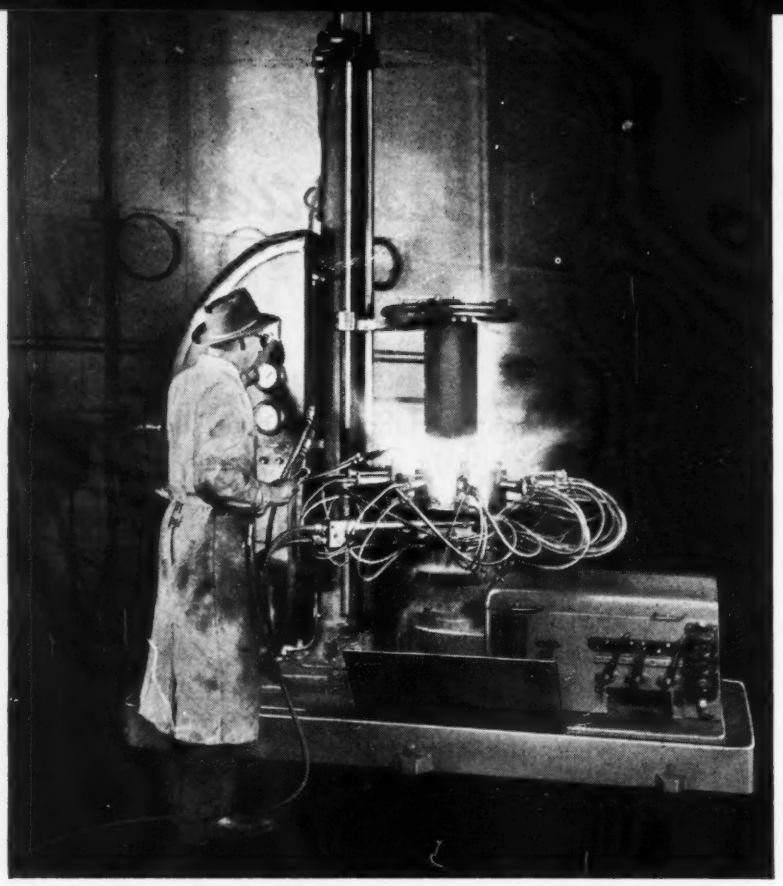
Costs of products can only be reduced by increased production per man-hour of work. The average hourly production per man is now much less than in pre-war years. It can be increased in two ways—by the wider use of labor-saving machinery and by greater efforts on the part of the workers.

Fortunately, labor leaders are beginning to realize this. As recently as September 22, John L. Lewis and other officers of the United Mine Workers of America addressed a letter to their members calling attention to the impending shortage of anthracite coal during the coming winter. This letter pointed out that increased daily production can be brought about by individual and collective cooperation between the coal operators and the mine workers.

This striking statement was made: "Each member and each operator knows in his heart if he can increase production. Each should examine his own conscience in the light of the facts and act accordingly. We have an obligation and a duty under these circumstances, and we ought to make every sincere effort possible, in keeping with our agreement and its established conditions, to have mutual cooperation to attain this much desired and necessary increased productivity in anthracite . . . We honestly and frankly believe that our best interests as mine workers will be conserved and furthered by attaining this production objective. It will also enure to the benefit of our families, our organization, and the communities in which we live, and we know that we are right in the hope that we will have a united and favorable response to these suggestions and recommendations."

This attitude on the part of one of the country's strongest unions is highly encouraging. It is to be hoped that the same willingness to cooperate for greater productivity will soon be apparent among labor leaders of other industries.

Charles O. Herb



Automatic

Typical Automatic Flame-Hardening Operations on Gears, Wheels, Long and Short Rolls and Cylinders, and Flat Surfaces

By M. R. NELSON
Works Manager
The Stearns-Roger Mfg. Co.
Denver, Col.

CONVENTIONAL hardening and tempering of gears often results in distortion. Such distortion of the gear teeth can only be corrected by grinding or lapping. During the war, in building about twelve hundred universal turret lathes, the Stearns-Roger Mfg. Co. discontinued the use of conventional hardened and tempered headstock gears and substituted flame-hardened Meehanite cast-iron gears.

The gears were completely finished, with their teeth shaved and bores ground, before flame-hardening. The flame-hardening process effected a considerable saving in manufacturing time and costs, and caused no distortion. A test transmission of such gears has been running in service continuously without a clutch. The operator clashes the gears into position when changing speeds, in order to give the gears a severe shock test. This test transmission is still in service, and and the gears have shown no evidence of wear or cracks.

Flame-hardening of gears, cylindrical work, and other parts by the progressive method, spinning method, or a combination of both methods

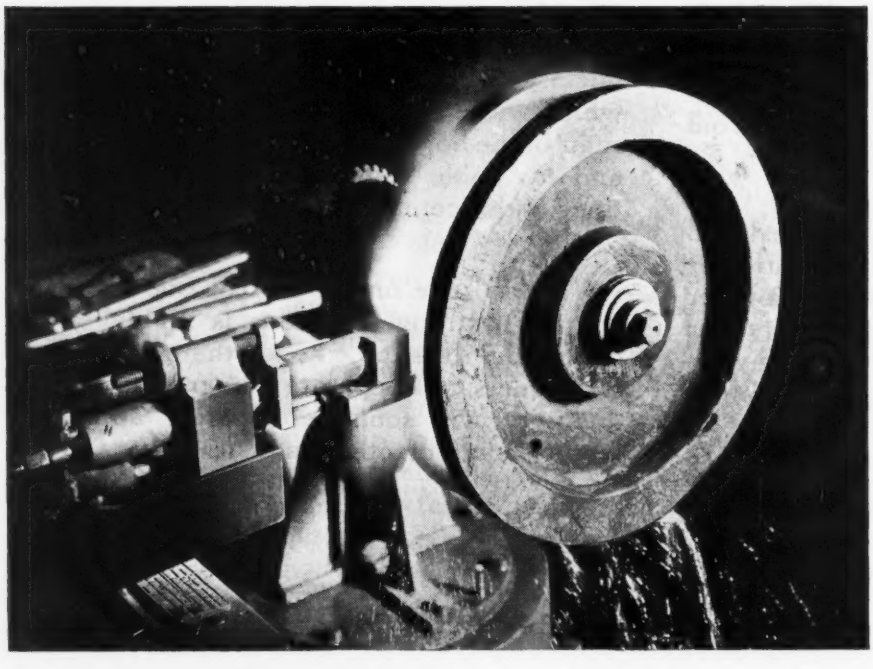


Fig. 1. Flame-hardening the Periphery of a 16-inch Diameter Meehanite Crane Wheel by the Progressive Method, in which the Work is Rotated and the Torch is Stationary

Flame-Hardening

is readily accomplished on the universal machine shown in the heading illustration, which is made by the Stearns-Roger Mfg. Co.

Cylindrical work, such as crane wheels, skip-hoist rollers, car wheels, pulleys, and sheaves, ranging from 7 inches to 6 feet in diameter, is flame-hardened by the progressive method. With this method, the torch or torches are held stationary, and the work revolved so that it passes the flames at a predetermined rate of speed. Peripheral speeds of the work vary from 1 to 12 inches per minute, depending upon the depth of case desired. In general, higher speeds and a closer spacing between the flame and the work result in relatively shallow case depths of from 1/32 to 1/8 inch. Decreasing the peripheral speed and increasing the spacing between flame and work to prevent burning increases the depth of hardness penetration. A 16-inch diameter Meehanite crane wheel is shown being flame-hardened by the progressive method in Fig. 1.

Traction wheels, 24 inches in diameter, with a rim 8 inches wide by 2 1/2 inches thick, were flame-hardened by this method to obtain a maximum depth of hardness. A peripheral speed of 1 inch per minute and a spacing between flame and work of 2 inches were employed. Etched sections of the hardened wheels showed a hardness depth of 7/8 inch. Brinell hardness of the wheel surface was 512. About seventy-six minutes was required to harden a wheel.

The progressive method of flame-hardening is also used for wear shoes and the coarse teeth of large gears. In this case, however, the work is held stationary and the flames are moved vertically upward past the work, closely followed by the quench.

A wear shoe is shown in Fig. 2 being flame-hardened and quenched by this method. The shoe, which is 2 inches wide by 3/4 inch thick, is placed against an angle-iron on the work-table of the flame-hardening machine. A multiple-flame torch, with integral water quench holes below the flame ports, is mounted on the torch carrier-ring and moved upward at the rate of about 4 inches per minute. An etched cut section of the wear shoe showed a hardened case 1/4 inch deep.

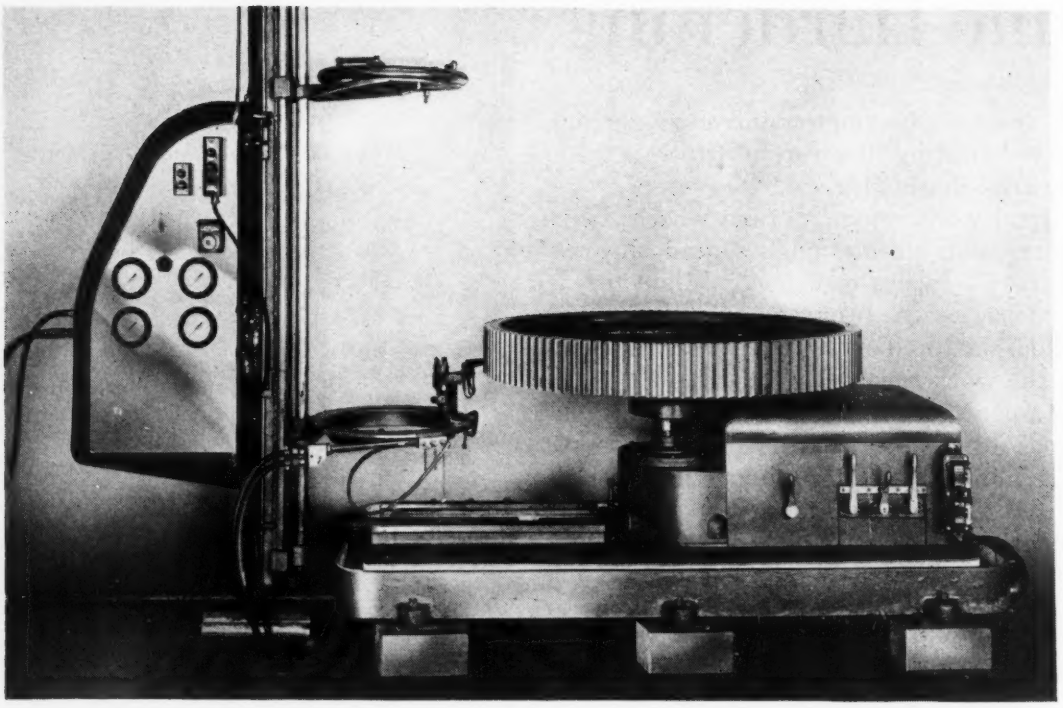
Large gears, having a diametral pitch of 6 or less, are flame-hardened by means of a pair of torches made specifically for the purpose. The torches, also having water quench holes below the flame ports, are mounted on an adjustable yoke fastened to the torch carrier-ring or swivel-arm of the machine, so that both sides of one tooth are treated simultaneously.

Fig. 2. Wear Shoe Being Progressively Flame-hardened by a Torch Traveling Vertically Upward at a Rate of About 4 Inches per Minute

The teeth of a 1 1/2-diametral pitch gear, 60 inches in diameter, are shown being flame-hardened in Fig. 3. The column unit can be removed from the base of the machine, as shown, to accommodate such large work. Vertical upward travel of the torches is set at from 3 to 6 inches per minute, depending upon the depth of case desired. The depth of hardness is usually restricted to one-sixth the tooth depth at the pitch circle of the gear on both faces of the tooth, thus leaving two-thirds of the tooth thickness as an unhardened inner core. This provides each tooth with a hard wearing surface to resist abrasion, and a tough, ductile core to resist shock.

The teeth of small gears, having a diametral pitch of more than 6, are flame-hardened by the spinning method, as shown in Fig. 4. The gear to be hardened is mounted on an arbor fastened to the work-table of the machine, centered, and revolved at approximately 100 R.P.M. A sufficient number of stationary torches is employed to efficiently heat the work above its critical temperature. At the end of the heating cycle, the flames are automatically shut off and the gear—while still rotating—is immediately quenched.

Smaller gears, having a diametral pitch of 8 or more, should be air-quenched to eliminate



hardening of the entire tooth depth. Although cooling in the air provides a slightly lower hardness, it insures a tough, ductile core.

The spinning method of flame-hardening can also be used successfully on other cylindrical parts having relatively small diameters and face widths. In general, it should be limited to parts that can be hardened in three minutes or less.

A combination of the progressive and spinning methods of flame-hardening is employed for relatively long cylindrical parts such as shafts, cylinders, pump liners, and spindles. The work is centered both on the machine table and by an upper centering device, and is rotated at about 60 R.P.M. per inch of outside diameter. The torches are mounted radially on the carrier-ring, and are moved progressively upward as the work revolves. The quench closely follows the flames, thus hardening a small portion of the part at a time. As with the other methods, speed of flame

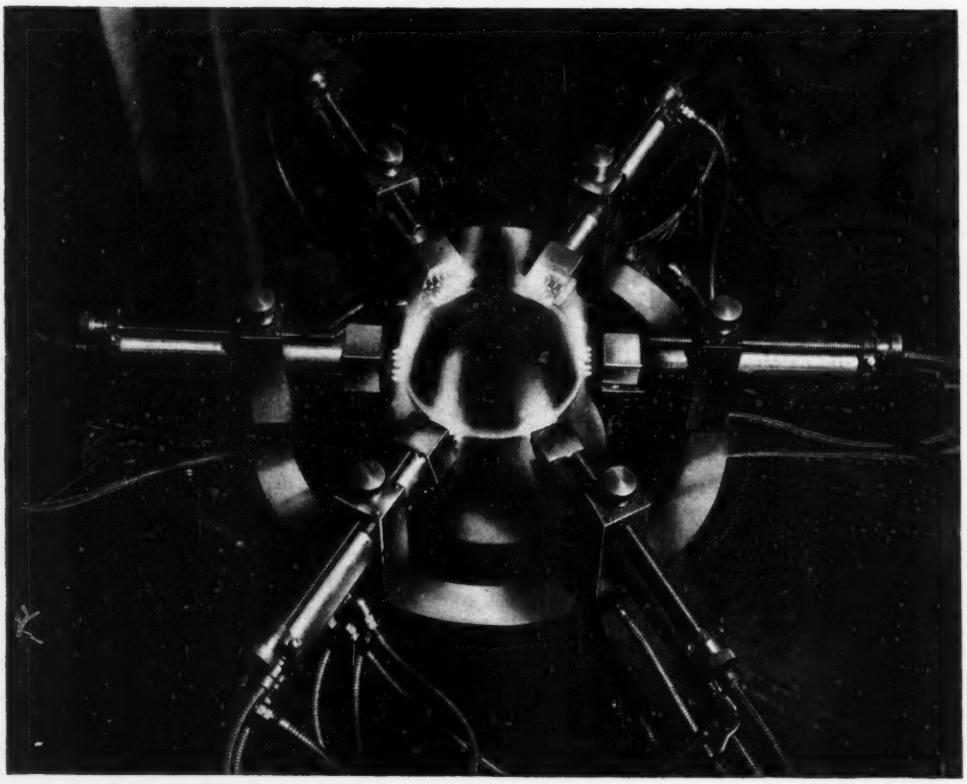


Fig. 3. (Above) Flame-hardening the Teeth of a 60-inch Diameter, 1 1/2 Diametral Pitch Meehanite Gear. Column Unit of Machine is Removed to Accommodate This Large Work

Fig. 4. (Left) Teeth of Small Gears are Flame-hardened by the Spinning Method, in which the Gear is Rotated at About 100 R.P.M.

travel and flame-to-work spacing vary with the depth of case desired.

Earlier attempts to flame-harden such parts while mounted horizontally were unsuccessful because the flame-to-work spacing would vary, due to bending of the work. In some cases, this bending action was so pronounced that the work would actually contact the torch tips, causing variation in case depth both circumferentially and longitudinally.

Boring-bars, 6 feet long by 4 inches in diameter, have been successfully hardened in this manner. The cast bars were machined, leaving 0.015 inch of stock for grinding after flame-hardening. Tests showed a surface hardness of 550 Brinell and a case depth of 3/16 inch. Four boring-bars treated by this method have shown no appreciable wear after two and a half years of service.

The interior surfaces of long cylindrical parts can also be hardened by this method. The part is centered on the work-table only for this operation, and is rotated at about 60 R.P.M. per inch of inside diameter. A special cylindrical torch, with integral water quench ports below the flame ports, is mounted on the carrier-ring, lowered to the bottom of the bore, and fed upward at a rate depending upon the depth of case required. As the diameter of the bore to be hardened—and the surface to be treated—increases, a larger torch with more flame ports is required.

Annual Meeting of Machine Tool Distributors

THE American Machine Tool Distributors' Association held its twenty-third annual meeting at the La Salle Hotel in Chicago on September 15. Many subjects of current interest were discussed, but the main topic was the Machine Tool Show, as the Association participated in the original arrangements of the Show and operated the general information booth.

Presiding at the Machine Tool Congress dinner, held in connection with the convention, was George Habicht, Jr., past-president of the Association and president of Marshall & Huschart Machinery Co. The opening remarks of the evening were made by K. H. Hobbie, president of the Machine Tool Congress and vice-president of Driver-Harris Co., Chicago, Ill., and Herbert H. Pease, president of the National Machine Tool Builders' Association, and president of the New Britain Machine Co., New Britain, Conn. The main address was delivered by Fulton Lewis, Jr., well-known news commentator, under the title "Democracy with a Gun in Her Ribs."

The following officers were elected for the coming year: President, D. N. Macconel, Machinery Sales Co., Los Angeles, Calif.; first vice-president, Robert L. Giebel, Giebel, Inc., New York City; second vice-president, O. W. Johaning, Colcord-Wright Machinery & Supply Co., St. Louis, Mo.; and secretary-treasurer, C. C. Brogan, W. E. Shipley Machinery Co., Philadelphia, Pa. Members elected to the executive committee to serve for three years are: George J. Keller, George Keller Machinery Co., Buffalo, N. Y.; W. W. Radcliffe, E. A. Kinsey Co., Cincinnati, Ohio; and Edward F. Strauss, Strauss & Haas, New Orleans, La.

Photo Western Machinery and Steel World

(Left) D. N. Macconel, Newly Elected President of the American Machine Tool Distributors' Association

(Right) Robert L. Giebel, First Vice-president of the American Machine Tool Distributors' Association

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Engineering News

"Train of Tomorrow"—the Last Word in Traveling Comfort

The "Train of Tomorrow," designed by engineers of the Electro-Motive Division of the General Motors Corporation and built to their specifications by the Pullman-Standard Car Mfg. Co., contains many radical features that will be incorporated into railroad cars of the future. Among these are the Astra Dome arrangement that gives an unobstructed view in all directions; Diesel generator sets that make each car independent of the rest of the train for power; tight-locked couplings that eliminate slack between cars; journal boxes that permit lateral movement of the axles; and such other innovations as multi floor levels, outside swing hanger suspension, intra-train telephone service, and amplifying system with loud speakers in all cars.

The Astra Dome design increases the capacity of the coach so that it is able to accommodate seventy-two passengers—a score more than can be carried in the ordinary coach. Already the Burlington Lines have ordered a large number of such units from one of the car builders. Also, the multi floor levels in each car increase the spaciousness of the interior and add to its attractiveness.

The train is composed of a Diesel engine and four cars—a coach, a dining car, a sleeper, and a lounge car. It is decorated with the colors and appointments of a luxurious home, and has rich carpets, nylon upholstery, plastic wallpapers, and the latest air-conditioning and lighting equipment.

Safety and comfort have been stressed in the design. Easier riding is provided by means of outside swing hanger suspension, which reduces side sway to a minimum. This feature was developed for locomotives and is now being applied to passenger cars. Coil springs and special shock absorbers contribute further to riding comfort. Besides the new journal boxes previously mentioned, each car has a detector system with warning lights to indicate overheating of the journal boxes.

As General Motors does not plan to enter the railroad car business, the train having been developed for experimental purposes only, any of the design features can be utilized by railroad car manufacturers.

High-Temperature Equipment for Spectrographic Analysis of Materials

High-temperature X-ray diffraction equipment has been perfected by the National Bureau of Standards. The new equipment is expected to reveal the crystalline modifications that take

The "Train of Tomorrow" Consists of a 2000-H.P. Diesel Locomotive and Four Cars—Day-coach, Diner, Sleeper, and Observation Lounge

place in some materials at temperatures above the 1000 degrees C. range of the ordinary diffraction apparatus; with a Norelco X-ray spectrometer, in which a Geiger counter replaces the photographic film, it can be used to obtain patterns at 1500 degrees C.

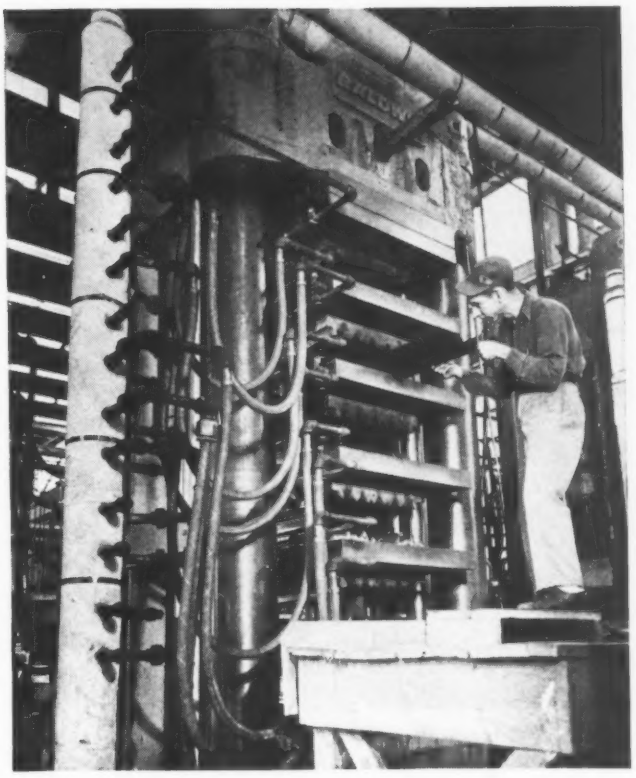
A resistance furnace of special design replaces the specimen-holder of the spectrometer. The temperature of this furnace is regulated and measured by a recording potentiometer operating from a thermo-couple whose junction is placed just above and in front of the specimen. Hence it is possible to obtain a pattern of a sample at a specified temperature. Since the pattern is produced immediately in a usable form, requiring no photographic processing, the crystalline state of the material being examined can be readily identified.

The apparatus offers a new approach to problems arising from the differences in atomic, molecular, and crystalline structures of many materials. Other applications include studies of the thermal expansion of powdered materials and of the crystalline changes that take place in ceramic materials during manufacturing processes.

Electroless Plating of Metals by Chemical Reduction

A new method of plating nickel and cobalt on metal surfaces without the use of electric current has been developed by the National Bureau of Standards. This process, known as "electroless plating," is brought about by the chemical reduction of a nickel or cobalt salt with hypophosphite in hot solution. The electroless deposits are of good quality and usually bright. Since they can be made as hard as tool steel, the method may prove useful where hard, wear-resistant surfaces are required.

Although the electroless nickel deposits are brittle when formed, they become ductile when heated. The deposits are harder than the ordinary electro-deposited nickel, and upon heating, their hardness is further increased. The adhesion of the nickel deposits to mild steel is such that it cannot be flaked off by bending, but on high-carbon steel this property is less satisfactory. In salt spray tests on steel coated with nickel, the protective value of electroless and electro-deposited coatings were virtually the same. Because of the moderate yield and the present high cost of sodium hypophosphite, the process is expensive, and commercial use is thus dependent upon a reduction in the price of this chemical.



One of the Large Hydraulic Presses for Molding High-pressure Laminated Parts at the New Coshocton Works of the General Electric Co.

Largest Plant for Producing Laminated Plastics

What is said to be the largest plastic laminating plant in the country recently was put in operation at Coshocton, Ohio, by the General Electric Co. The new plant employs approximately six hundred workers.

Large quantities of wood-veneer, paper, cotton, and asbestos-base laminates are being produced, using both melamine and phenolic resins. In the near future, silicone-resin glass-cloth plastics will be added to the line. Besides their wide application to electrical equipment, these laminated plastics are finding increased use for structural members, machine parts, and decorative panels.

The manufacturing facilities in the plant include a large hydraulic press capable of producing laminated sheets 50 by 100 inches in size, another press that forms sheets up to 30 by 110 inches, and a considerable number of other units ranging in capacity from 10 to 1800 tons. In addition, there is a large fabricating area with equipment for performing punching, drilling, shearing, sawing, turning, milling, and other operations on the sheets and high-pressure molded sections; and another department especially equipped to trim and paint refrigerator door panels.

Applying Resistance Welding in Tank Production

AN improved product and reduced costs have resulted from the application of resistance welding in the manufacture of gasoline tanks by the White Motor Co., Cleveland, Ohio. The tanks are now not only stronger and more leak-proof, but actually cost 30 per cent less than when made by previous methods. As about 25,000 of these twenty-six gallon tanks are produced a year, it is estimated that the savings will pay for the cost of the new equipment required in six months. The tanks, complete with internal baffle plates, are produced at the rate of 100 every eight hours on the four resistance welding machines shown in the heading illustration, which are built by the Progressive Welder Co.

The tanks are made from 18-gage terne plate, which is formed, crimped, and soldered prior to welding. After the tank body has been formed by rolling the terne plate, it is placed on a 75-KVA pedestal type spot-welder with a 24-inch throat. Here the overlapping ends of the rolled sheet are tacked together with from four to six spot-welds. The filler neck and small fittings are next assembled to the tank body in a bench operation.

The tank body then goes to the 200-KVA seam-welder shown in Fig. 1. Here the 44 1/2-inch longitudinal seam is welded pressure-tight in two passes, half of the seam being welded from each end toward the center. A heavy lower arm is employed on this machine to permit the use of a deep throat. The machine is of the universal type, allowing the head to be swung through an angle of 90 degrees for circular seam welding.

At the completion of this operation, the tank is returned to the spot-welder previously used for tack-welding, where two baffle plates are spot-welded inside the tank in the set-up shown in Fig. 2. Twenty-eight spot-welds are made—three on the top, three on the bottom, and four on each side of both baffle plates. The machine performs this job without any change in setting from the first tack-welding operation.

From here the tank is transferred to a second spot-welder, a 75-KVA machine with a 12-inch throat, as seen in Fig. 3. Here the two ends are tack-welded to the tank to locate them for a subsequent seam-welding operation. The lower electrode on this machine is set at an angle of 30 degrees to permit welding close to the corners of the tank ends.

The last welding operation is performed on the 200-KVA circular seam-welder shown in Fig. 4. Here the end plates are welded to the tanks with

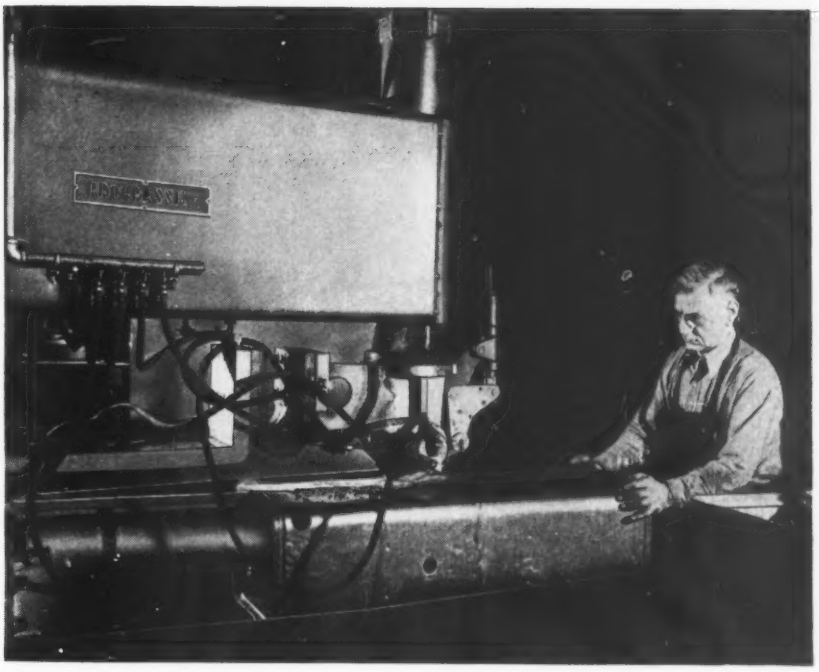


Fig. 1. The Longitudinal Seam of a Gasoline Tank Body is Welded Pressure-tight in This Set-up. Two Passes are Required, Half the Seam being Welded from Each End

pressure-tight seams. The 6-inch diameter air cylinder used on this machine provides adequate pressure to insure the pressure-tight seam required, particularly in the corners of the tank. The upper welding wheel has a diameter of only 3 5/8 inches to suit the corner of the tank, which has a radius of 1 15/16 inches. The lower wheel is 8 inches in diameter. With 51 inches of seam at each end, this machine welds over 100 inches of circular seams on each tank.

The completed tank body then goes to a bench for minor operations, such as soldering of the drain plug, filler spout, etc. To perform these operations on resistance welding machines would require either additional equipment or a resetting of the timing on the machine.

Fig. 2. Baffle Plates are Welded Inside the Tank Body on a 75-KVA Machine. Fourteen Spot-welds are Applied to Each Baffle

Fig. 3. Tack-welding the Ends to the Tank. The Lower Electrode is Inclined 30 Degrees to Permit Welding Close to the Corners

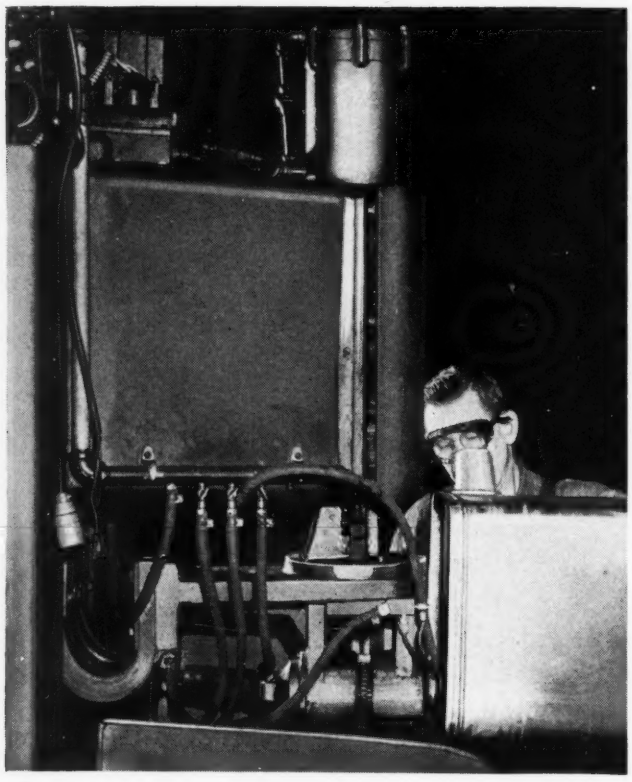


Fig. 4. Circular Seam-welder with Small-diameter Upper Welding Wheel to Facilitate Welding of Inside Corners. Over 100 Inches of Seam per Tank are Welded on This Machine

As an extra protection against the possibility of leaks, the ends of the tank are dipped in a solder bath before being tested under five pounds per square inch air pressure. A gallon of anti-rust liquid is poured in, and the tank is rotated and drained before it goes to the assembly line.

* * *

Diamond Indentation Method of Measuring Wear

Investigations conducted at the National Bureau of Standards by S. A. McKee have led to the adaptation of a diamond indentation method of measuring the wear of working surfaces of machines. As a result, a sensitive measuring instrument was developed to measure extremely small increments of wear. The gage was designed primarily for determining the wear of cylinder walls and pistons of aircraft engines, but should be applicable to other machine elements, gages, dies, etc. By applying to the working surfaces narrow diamond-shaped markings that show a definite change in one or more readily measurable dimensions after small amounts of wear, the gage provides an indication of wear at the point where the marking is made.

Special apparatus was developed for making and measuring the marks placed on the wearing surfaces by the diamond indenter of the wear gage. With the work mounted in a specially designed fixture, marks are applied at any desired position on the surface by the apex of a four-sided diamond pyramid, which is forced by mechanical pressure to a predetermined depth into the surface. The viewing and measuring apparatus consists of a conventional microscope and eye-piece scale, modified by the addition of two right-angle prisms so that it can be used as a periscope for viewing the inside of cylinders. The impression of the marks raises a burr, but most of this burr can be easily removed by rubbing lightly with fine polishing paper.

The precision of the wear measurements depends upon the condition of the indentation. With new marks, the points are sharp and the lengths can be accurately determined. After operation, the marks are somewhat blunted and it is necessary to estimate the position of the point. Under normal conditions, the cylinder wear can be determined with an accuracy of $\pm$ 0.00004 inch. With more favorable conditions, the degree of accuracy can be increased to $\pm$ 0.00002 inch. Operating experience with marks in pistons indicates that, with the softer aluminum alloy, the marks have a much greater tendency to distort and the results are not entirely satisfactory. Also, the tendency of this material to become impregnated with carbon makes it difficult to find marks.

The chief limitation of accuracy is that the sharp points of the marks are blunted somewhat when wear occurs. Possible use of cutting or grinding methods for producing marks without burrs and sharp-pointed ends presents a promising field for further investigation. If this can be accomplished, the accuracy of determining wear will be greatly increased.

The McKee wear gage has the advantage of indicating wear only, while the usual method of determining wear by measuring the changes in diameter of pistons and cylinders does not distinguish between wear and the distortion that may occur during a test. It also indicates wear at a particular point on the surface, whereas measurements of diameter involve changes at two points, and practical means are not generally available for determining the amount of wear at each point. Also the method does not require the careful technique necessary to measure diameters with corresponding accuracy. As temperature variations do not materially affect the accuracy with the indentation method, it is not necessary to bring the cylinder to a definite temperature before making the measurements.

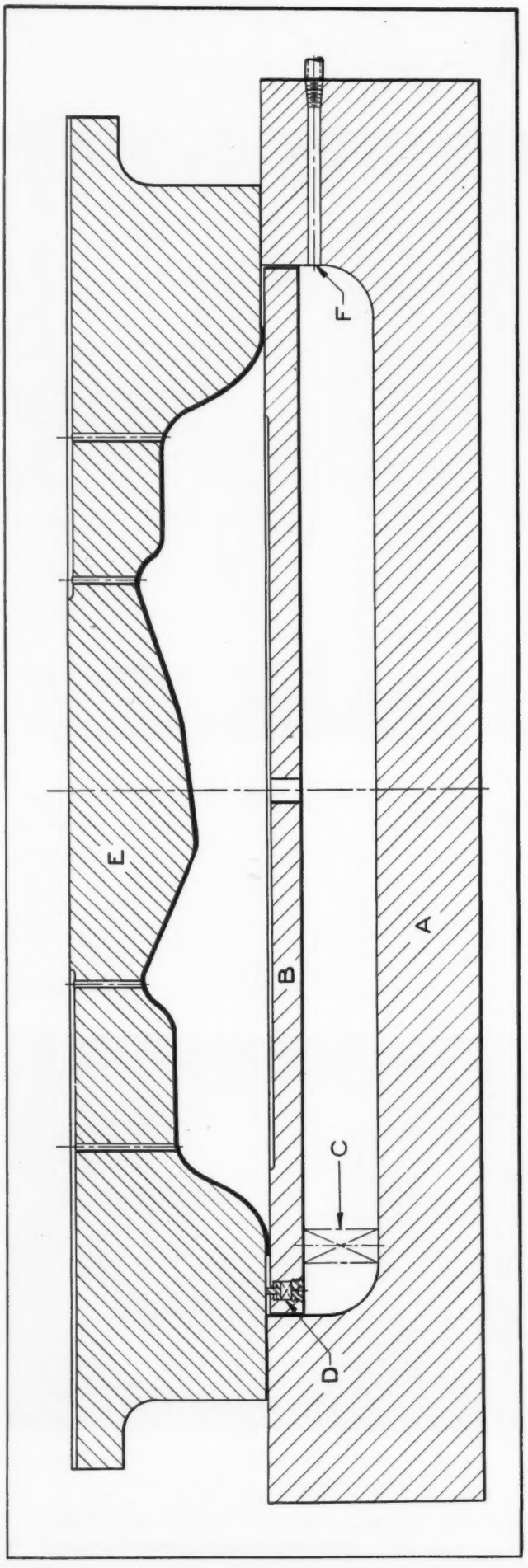
Hydrodynamic Method of Drawing and Embossing

An Unusual Method of Drawing or Embossing Difficult Shapes in One Operation

PARTS that are difficult to form by conventional methods can be readily produced by the Hydrodynamic process developed by L. V. Whistler and S. A. Whistler, 748 Military Road, Buffalo 17, N. Y. This method is particularly adaptable to the forming of shallow shapes and the drawing of cone-shaped and tapered stampings. It is not intended for the forming or drawing of straight-walled stampings, as these can be handled more economically by the usual methods on mechanical presses.

Certain hardened and tempered aluminum alloys have been drawn to the required shape by this process, thus eliminating heat-treatment, and consequent straightening, after drawing. Armco enameling iron 0.078 inch thick, brass 0.031 inch thick, Inconel metal 0.025 inch thick, 18-8 stainless steel 0.078 inch thick, 25-20 stainless steel 0.032 inch thick, and 24S-O aluminum

Fig. 1. (Left) Extra Deep Part Drawn from 0.078-inch Cold-rolled Steel by Means of the Hydrodynamic Die Set-up Shown in Fig. 3. Fig. 2. (Above) Reflector Drawn from 0.040-inch, 2S-O Aluminum Alloy in One Operation



alloy 0.125 inch thick have been successfully drawn in production.

The Hydrodynamic process was so named because it uses the power of water under pressure for performing drawing and embossing operations. A die only is required, since the high-pressure water, which adjusts itself to the die impression, is substituted for the punch. In embossing, a sheet-metal blank placed on an auxiliary bed is brought into contact with a stationary die mounted on the crown of the press. Sufficient pressure is exerted by the hydraulic ram in the base of the press to pinch the blank at its edges, and thus prevent the material surrounding the embossed part from moving while the stretch-forming is taking place.

In drawing, the metal blank is allowed to slide between the adjacent faces of the die and a pressure pad as the stamping is formed. This operation can best be explained by referring to the cross-section of a typical die, Fig. 3. The extra deep part drawn in this die from 0.078-inch thick cold-rolled steel is shown in Fig. 1.

Water container and pressure-pad holder *A*, Fig. 3, which is mounted on the hydraulic ram in the base of the press, can be round, square, or rectangular, depending upon the shape of the part to be drawn. Pressure pad *B* is located in a recess in the top of container *A* and rests on springs *C*. These springs exert sufficient pressure to allow the blank to flow and at the same time prevent wrinkles from forming during the drawing operation.

A predetermined size blank is placed on the top face of the pressure pad, nested between spring-pin gages *D*. The container, pressure pad, and work are then raised by the hydraulic ram until the under side of die *E* comes in contact with the top face of the container. A metal-to-metal seal is maintained between these two faces, no gaskets being required.

High-pressure water is then admitted through opening *F* in the container. The exact pressure used depends upon the material and shape being drawn. The water is forced up through the hole in the center of the pressure pad, and acts as a fluid punch, exerting a steady, uniform pressure over the entire surface of the blank, and thus drawing it to the desired shape. Air vent holes are provided in the die to permit the air to escape from the die cavity as the part is formed.

The heading illustration and Fig. 4 show the production of reflectors in the Whistler plant.

Fig. 3. Set-up for Deep-drawing Part Shown in Fig. 1. High-pressure Water Entering through Opening F Forces Blank to Conform with Contour of Die E

Fig. 4. Reflectors are Drawn on This 3000-ton Hydraulic Press by the Hydrodynamic Process

A 3000-ton hydraulic press, modified for the Hydrodynamic process, is used to draw the reflectors from 0.040-inch thick, 2S-O aluminum alloy in a single operation. A close-up view of one of the drawn parts is shown in Fig. 2. Rounded corners and smooth, deep contours are essential in this part, which has a highly polished, reflective interior surface. Although this part could be drawn by mechanical means, tool marks and abrasions on the reflector surface would cause numerous rejections and make the operation an expensive one.

Depending upon their size, two or more stampings can be produced in one operation by the use of a multiple die and a water container with several pressure pads. Also, complicated stampings having a variety of contours and dimensions can be drawn in one operation rather than having to stamp separate sections and weld them together.

With this process, the same die can be used to draw different materials. In one case, a 0.050-inch thick Armco enameling iron stamping was being produced by the Hydrodynamic process and it was decided to make the part from 0.031-inch thick 18–8 stainless steel. This was accomplished without altering the die. Stampings made by this process can be laid flat on a surface plate without any appreciable twist or warp.

The total force of the high-pressure water entering the die cavity is built up gradually and is applied to the larger areas first, thus allowing the metal to be progressively drawn into the desired shape with a minimum of twisting or warpage. This is conclusively shown by the successful drawing of tapered or conical parts in one operation. With conventional methods, the relatively sharp point of the punch, which strikes the metal first, often causes fracture of the blank.

It will be apparent that the method described has the advantages of reducing die costs and eliminating localized draw strains and redraw marks in the stamping.

* * *

Carborundum Co.'s Employe Educational Program

A plan, known as the Educational Reimbursement Program, designed to promote the self-improvement of its employes has been instituted by the Carborundum Co., Niagara Falls, N. Y. The object of the program is to give financial aid and encouragement to those employes who are interested in obtaining added knowledge and training by taking courses in educational institutions, such as schools, colleges, universities, and correspondence schools. In accordance with the plan, when the employes have completed their courses of study, they are reimbursed to the amount of $75 a semester.

All employes of the company with six months of continuous service are eligible to participate in the program. Courses may be in any subject that will provide instruction relating to the individual's work and that will serve to enhance his knowledge and increase his capacity to meet his responsibilities, as well as courses not directly related to his work but that will fit him for future assignments.

Materials of Industry

THE PROPERTIES AND NEW APPLICATIONS OF MATERIALS USED IN THE MECHANICAL INDUSTRIES

Improved Cutting Oils of High-Sulphur Content and No Odor

A major improvement in cutting oils, combining extremely active sulphur content with absence of disagreeable odor, has been achieved by the Gulf Oil Corporation, according to a recent announcement. The new development has been incorporated in improved grades of Gulf's Lasupar cutting oil, Electro cutting oil, and L. S. cutting base.

The sulphur in these oils is chemically combined so that it is uniquely active over the entire range of a cutting operation, according to the maker. The resulting high efficiency is ascribed to the fact that the amount of chemically active sulphur (rather than the total percentage of sulphur contained) governs cutting oil performance. 201

Air-Drying Rack Coating Cuts Down Application Time

An air-drying rack coating recently announced by the U. S. Stoneware Co., Akron 9, Ohio, is said to cut down application time by almost 75 per cent. This coating (designated No. 266) can usually be applied to the required thickness in two dips, and needs only twenty to thirty minutes drying time. It is resistant to all plating solutions, including hot alkaline cleaners; adheres well to all surfaces; and is flexible and resilient enough to withstand mechanical shock in handling. 202

New Die Steels with Exceptionally High Impact Strength

Dispersed segregate die steels, claimed to possess an exceptionally high impact strength, have been added to the line of "Desegatized" brand steels made by the Latrobe Electric Steel Co., Latrobe, Pa. Four high-carbon, high-chromium grades are being produced. The grades manufactured are Select B, modified-chrome air-hardening; G.S.N., high-carbon, high-chrome oil-hardening; Olympic, high-carbon, high-chrome air-hardening; and Cobalt Chrome, special high-carbon, high-chrome, cobalt air-hardening.

An even dispersion of free carbides is achieved in the body of the new steels, eliminating grouping together of carbides in a brittle central mass. This quality is claimed to give a more uniform bar, substantially decreased warpage and breaking, and more consistent results under heat-treating. 203

Soldering Compound Acts as Bond for Magnesium and Zinc

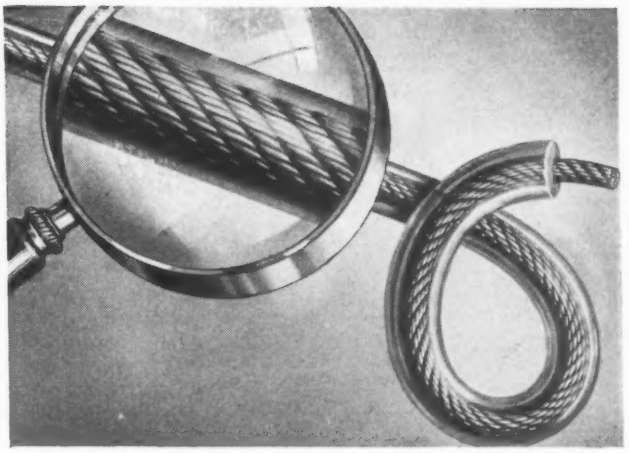
A soldering compound known as "Galvalloy," developed during the war, is now being made available by Metalloy Products Co., 1351 E. 17th St., Los Angeles 54, Calif., for aluminum and magnesium soldering applications. After tinning a magnesium surface with "Galvalloy," pure zinc, ordinary solder, or pot metal can be used as a filler or soldering agent. A permanent bond is thus obtained. Because it withstands the corrosive action of degreasing vapors, "Galvalloy" has been used successfully in repairing corroded areas of degreasing tanks. 204

Spot Enamel Stripper Applicable to Large Parts

A spot enamel stripper, designated S-45, has been developed by Enthone, Inc., 442 Elm St., New Haven, Conn., for the removal of synthetic enamels and other coatings. This stripper is recommended especially for large parts that cannot be immersed in a stripping solution.

It is a slightly viscous liquid that can be brushed, sprayed, or applied by dipping, and contains an evaporating retardent that prolongs the stripping action. The compound causes the enamel to wrinkle, so that it can be readily brushed, wiped, or scraped off. No waxy residue is left to interfere with adhesion of subsequently applied finishes.

The new stripper is stated to have very fast action on most synthetic enamels, as well as on



Unusual Cable Consisting of a 3/32-inch Steel Wire Rope Core with Extruded Covering of a Du Pont Special Formula Nylon. The Cable, Made by the Danielson Mfg. Co. of Danielson, Conn., is Highly Resistant to Oils, Acids, Moisture, Salt Water, Abrasion, and Fire. It Does Not Fray, Rust, or Rot

certain nitro-cellulose coatings. It is not satisfactory for linseed oil paints, phenol-formaldehyde enamels, or vinyl type coatings. Modified urea-formaldehyde, melamine, and alkyd coatings are rapidly stripped. The stripper has no harmful action on metals, plastic, or wood...205

Welding Compound Supplements Action of Rod Coating

An improved arc-welding compound developed to produce cleaner, better welds is being manufactured by G. W. Smith & Sons, Inc., 5400 Kemp Road, Dayton 3, Ohio. "POM," as this compound is called, is an electrically conductive composition of inorganic minerals which supplement the fluxing action of the welding rod coating. Its action stabilizes and quiets the welding arc, prevents arc interruption, improves finish, and precludes scale on both sides of the weld bead. It also prevents the adhesion of weld spatter to the parts being welded.

No smoke, fumes, or odors are produced by the use of the new welding compound. Application is by brushing or spraying into the seam to be welded and on adjacent surfaces where spatter usually collects. After welding, all spatter is quickly wiped off with a dry cloth.....206

Ready-Mixed Aluminum Paint Has High, Long-Lasting Brightness

Aluminum paint with a corrosion-resistant, synthetic resin vehicle and an aluminum powder that "leafs" unusually well is now being made available by Prufcoat Laboratories, Inc., 63 Main St., Cambridge 42, Mass. The action of the synthetic resin vehicle, which transmits approximately 95 per cent of the visible light, gives higher brightness to the paint and protects the aluminum particles from dulling due to atmospheric action. The volatile solvents evaporate sufficiently within a few minutes after application to leave the coating dry to the touch....207

To Obtain Additional Information on Materials of Industry

To obtain additional information about any of the materials described on these pages, fill in below the identifying number found at the end of each description—or write directly to the manufacturer, mentioning name of material as described in November, 1947, MACHINERY.

No.	No.	No.	No.	No.	No.	No.	No.	No.	No.

Fill in your name and address on the blank below. Detach and mail within three months of the date of this issue to MACHINERY, 148 Lafayette Street, New York 13, N. Y.

NAME.....POSITION OR TITLE.....

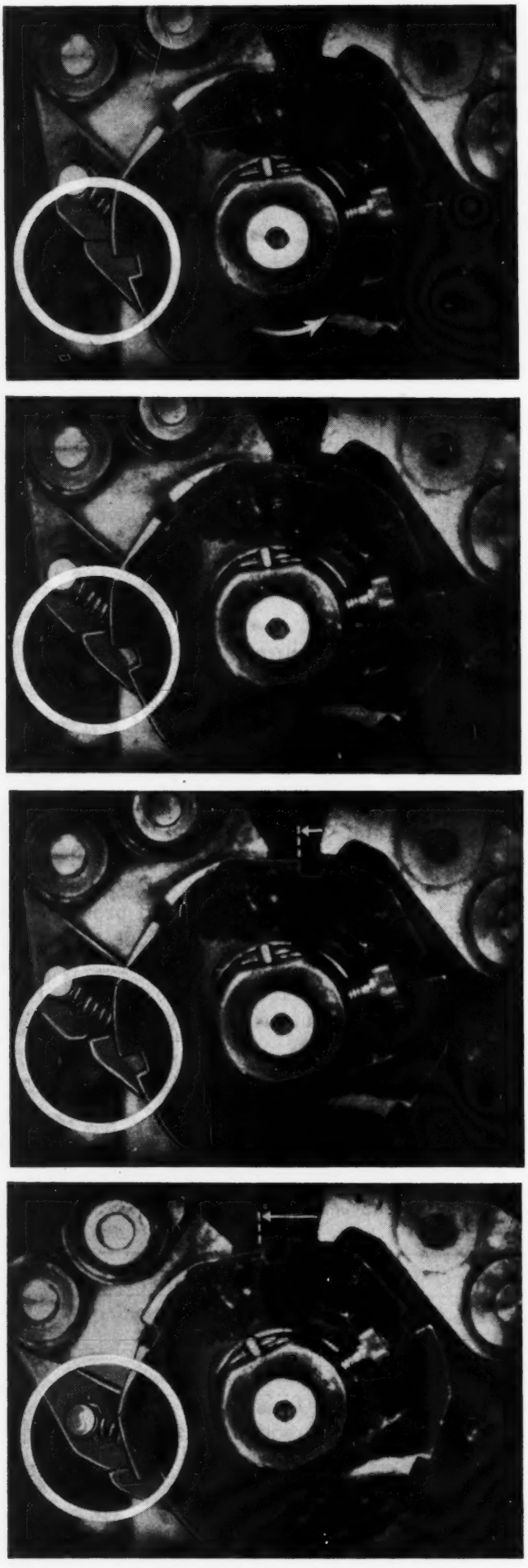
[This service is for those in charge of shop and engineering work in manufacturing plants.]

FIRM.....

BUSINESS ADDRESS.....

CITY.....STATE.....

High-Speed Movies Trace Cause of Wear



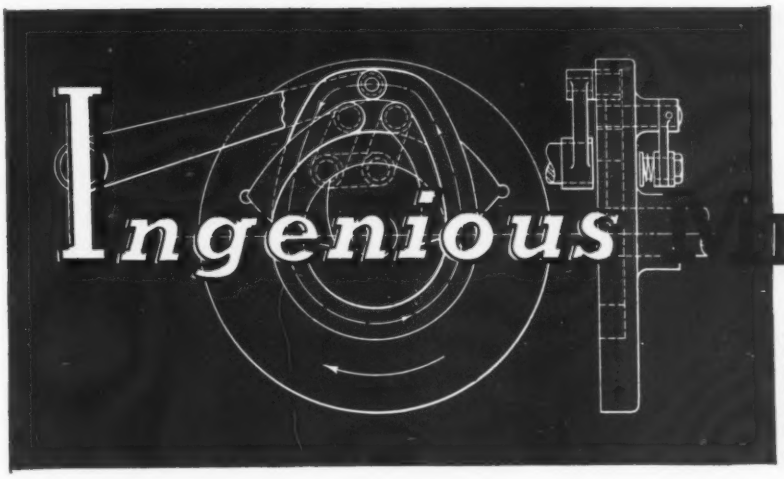
NO still photograph, nor series of photographs, can adequately illustrate the information that high-speed motion pictures of machinery make available. An example of the value of motion pictures in analyzing the cause of trouble in the operation of machines is seen in the accompanying illustrations. These photographs are enlarged from a 16-millimeter movie made with an Eastman high-speed camera at speeds of from 1000 to 3000 frames per second.

The machine embodying the ratchet feed illustrated was repeatedly out of service due to the necessity of replacing the ratchet wheel and pawl. Six times each second the pawl had to index the 2 1/2-inch diameter ratchet wheel, with only one-hundredth of a second allowed for engagement. After the wheel had been indexed one-sixth of a revolution, and the register pawl shown at the right of the top illustration had engaged a locking slot, the indexing pawl (shown in a white circle at the left) moved vertically to engage another ratchet wheel tooth. Neither ratchet wheel nor pawl stood up under this treatment.

Ultra-speed motion pictures of the machine revealed that the indexing pawl bounded off the ratchet wheel tooth. This movement, which occurred when maximum force was exerted to overcome inertia, is indicated by the position of the register pawl at the top right. The length of contact surface between the ratchet wheel and the indexing pawl became progressively less before the ratchet was returned by the coil spring. As a result, the corners of both ratchet wheel tooth and pawl wore quickly. A change in pawl shape, reversing the rebound force component, ended the difficulty.

The second and third frames in the illustration indicate the rebound action of the indexing pawl during the fraction of a second that maximum force is applied. The motion of the indexing pawl and the ratchet wheel is indicated by the change in relationship between the register pawl and its locking slot. As seen in the bottom frame, the coil spring has acted upon the indexing pawl to restore contact.

Four Frames Enlarged from a High-speed Motion Picture to Show How the Indexing Pawl, in the White Circles at the Left, Rebounded from Ratchet Wheel Tooth before Coil Spring Restored Contact, Resulting in Rapid Wear



MECHANISMS

Mechanisms Selected by Experienced Machine Designers as Typical Examples Applicable in the Construction of Automatic Machines and other Devices

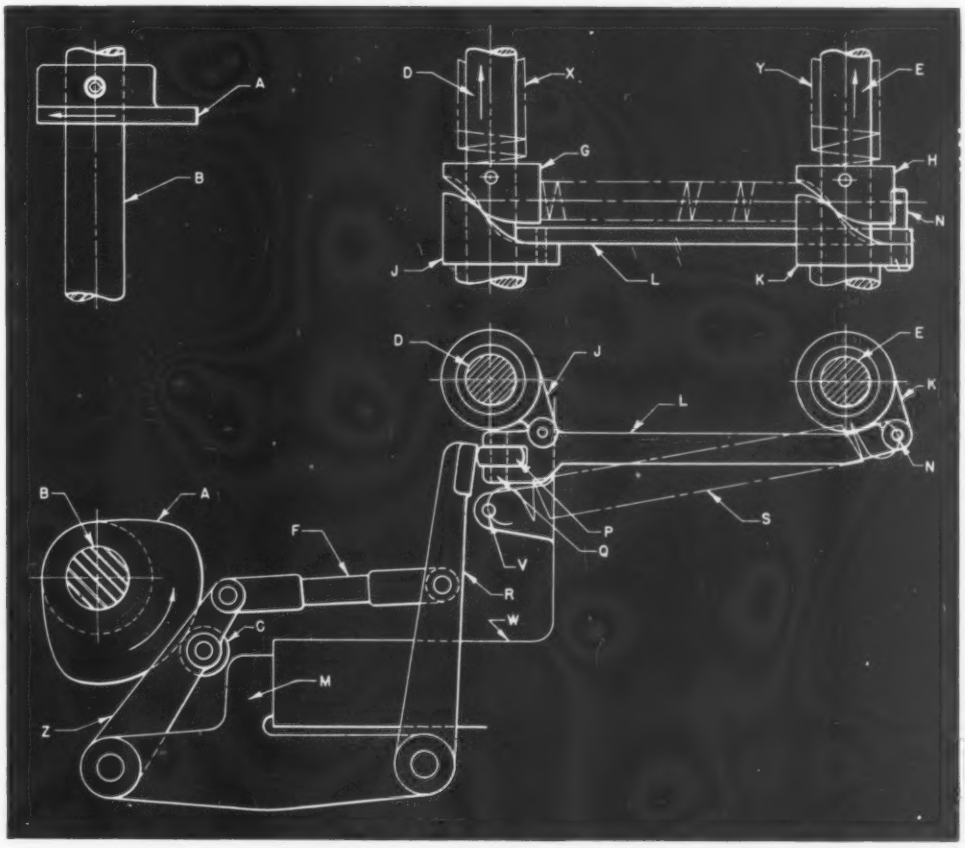
Multiple Cam and Lever Mechanism

By F. HARTLEY

The multiple cam and lever mechanism shown in the accompanying illustration was designed to impart a movement to rods *D* and *E*, in the direction indicated by the arrows, through rotating shaft *B*. Interfering members and the considerable distance between shaft *B* and the rods made a simple drum cam and lever mechanism impractical for this particular application.

Rods *D* and *E* are prevented from rotating by slots in their ends, which slide along keys in the frame of the machine. Collars *G* and *H*, which are pinned to the rods, are machined on one side to form face cams. These cam surfaces slide on the cam surfaces of the two lever type collars *J* and *K*. The collars are joined by connecting-rod *L*. The roller *P*, which is mounted on one end of this connecting-rod, is free to rotate on the pin *Q* and rolls along the pad at the upper end of lever *R*.

With cam *A*, roller *C*, lever *Z*, adjustable connecting-rod *F*, and lever *R* in the positions shown, the face cams have advanced rods *D* and *E* to their extreme forward positions. As cam *A* continues to rotate with shaft *B* in the direction indicated by the arrow, and roller *C* leaves the lobe of the cam, spring *S* returns the parts of the mechanism to their original positions. This spring is hooked over pin *V* in the frame of the machine and stud *N* in collar *K*. Springs *X* and *Y*, which are compressed during the advance stroke of rods *D* and *E*, are then free to return the rods and collars *G* and *H* to their starting positions.



Rods D and E are Moved in the Direction Indicated by the Arrows on the Plan View by Cam A on Rotating Shaft B and Connecting Linkage

Automatic Transfer and Feeding Mechanism

By WALLACE C. MILLS

The automatic work transferring and feeding mechanism shown in Fig. 1 enables one person to operate a series of punch presses equipped to perform successive stamping operations. The stampings *A* are blanked and drawn in the press shown to the right in Fig. 1 and are then blown by air pressure through a chute to the press at the left. The stampings are located in the die of the latter press by an automatic feeding mechanism. The feeding mechanism is shown on one press only, but other presses equipped with similar feeding devices can be added to the production line. This type of die with its lateral feeding mechanism can be adapted for handling different kinds and sizes of work. It operates at high speed and eliminates the need for a second operator in many instances.

As shown in the illustration, the stamping *A* is blown through chute *B* by compressed air from tube *C* after it has been knocked out of punch *D* on the up stroke of the press ram. The chute can be twisted, as shown in the illustration, for turning the work upside down if it is desired to feed it to the die in an inverted position.

The blanked and drawn stamping blown through the chute comes to rest against stop *E*, which is also shown in Fig. 2. The lateral feed-slide *F* now engages the stamping and pushes it forward into the spring-actuated receding jaws *G* which center it on the die *H*, Fig. 1. The slide is then withdrawn from the path of the descending punch. On the down stroke of the press, a spring pin *I* projecting from the center of the punch comes in contact with the stamping and holds it against the die until the punch engages the work. The jaws are then pushed out of the way by contact of the tapered end *J* of the punch with the tapered surface *K* of the jaws.

On the up stroke of the ram, the stamping is pushed off the punch by pressure exerted by a spring-actuated stripper located within the punch. The stamping is held down by the spring pin *I* until it is gripped by the in-

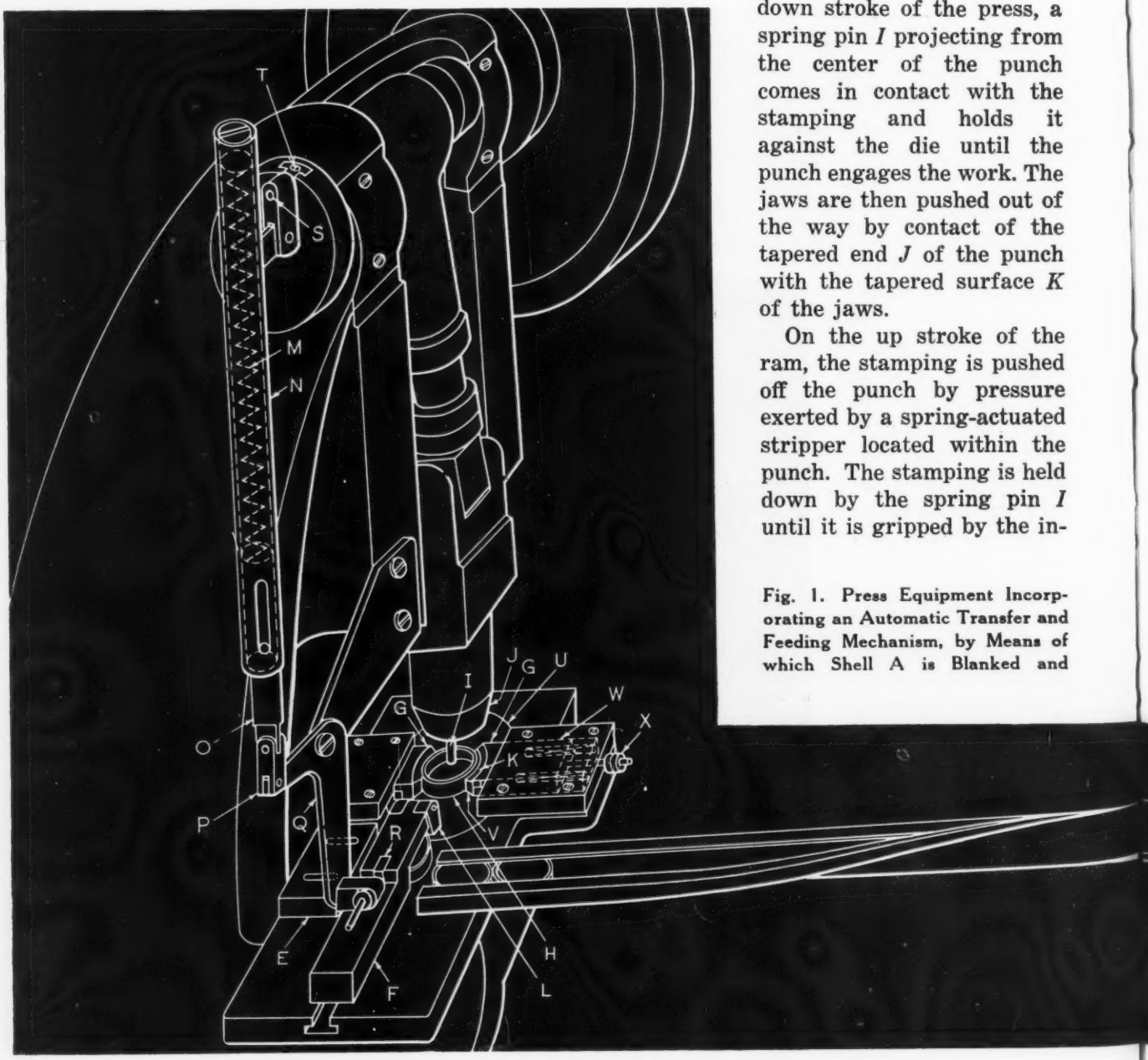


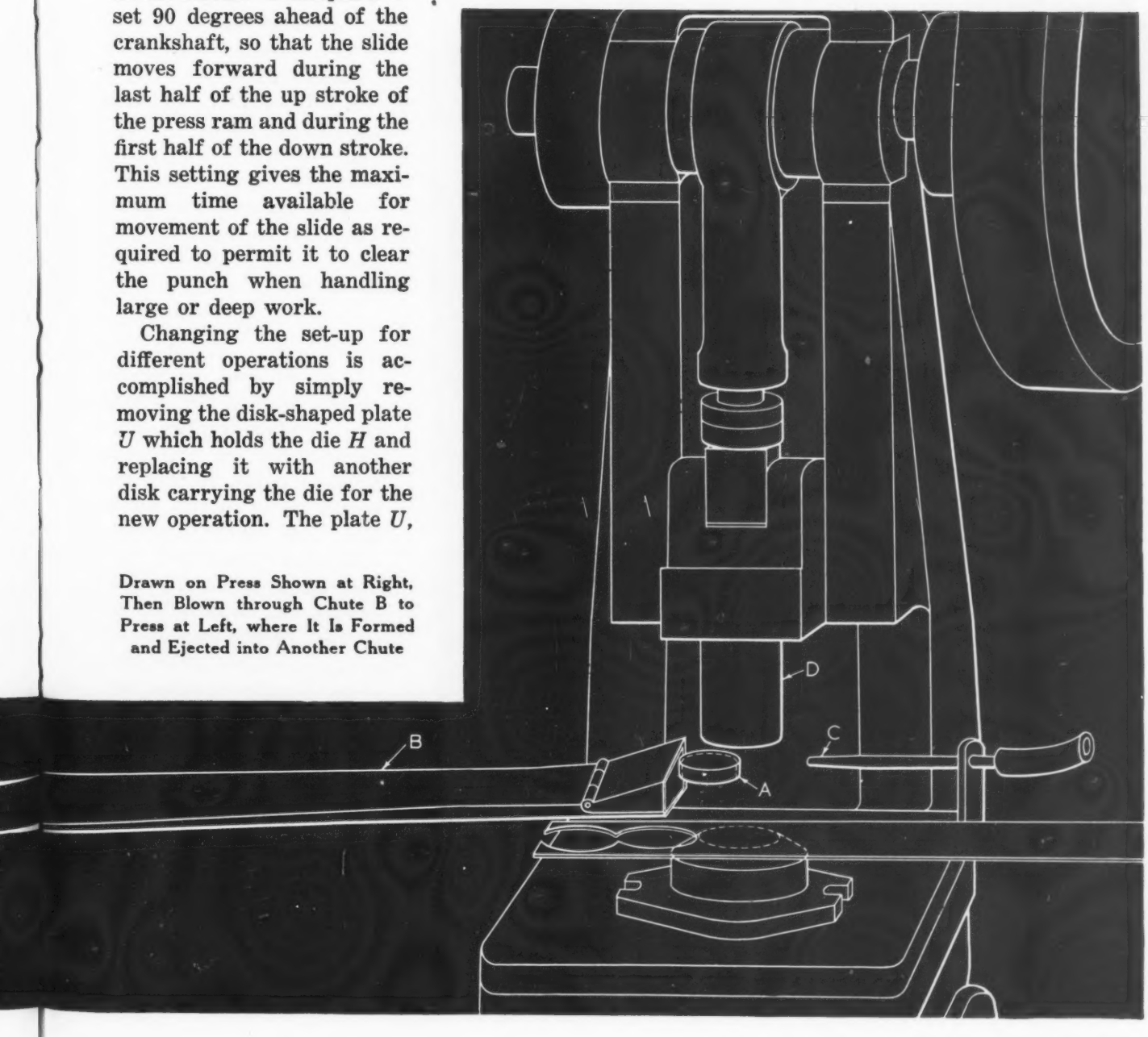
Fig. 1. Press Equipment Incorporating an Automatic Transfer and Feeding Mechanism, by Means of which Shell A is Blanked and

ward moving jaws. The finished stamping is pushed out of the jaws by a pawl attachment *L* on the front end of the feed-slide *F*.

The forward movement of slide *F*, which pushes the stamping from the jaws *G*, is spring-actuated, while the return movement is obtained by positive mechanical means. The yielding movement provided by the spring *M* on the forward stroke of the slide prevents jamming in the event that the slide is blocked in any manner, as, for instance, when a stamping is engaged by the slide before it has cleared the chute. The long spring *M* is contained in a two-part telescoping rod *N* which is connected to the slide through links *O*, *P*, *Q*, and *R*. The slide is actuated from the crankshaft of the press by crankpin *S*, which can be adjusted toward or away from the center of the crankshaft by screw *T* to vary the length of the stroke. Crankpin *S* is set 90 degrees ahead of the crankshaft, so that the slide moves forward during the last half of the up stroke of the press ram and during the first half of the down stroke. This setting gives the maximum time available for movement of the slide as required to permit it to clear the punch when handling large or deep work.

Changing the set-up for different operations is accomplished by simply removing the disk-shaped plate *U* which holds the die *H* and replacing it with another disk carrying the die for the new operation. The plate *U*, Fig. 1, is designated *H* in Fig. 2. Individual jaw adapters *V* which fit the work are attached to slides *W*. The jaws are opened by means of adjusting nuts *X*. The position of stop *E* is adjusted to suit the size of the work. In certain cases, the positioning attachment on the front end of the slide is also changed. The most important other modifications apply to the perforating or blanking dies, and consist of providing guide pins in plate *U* which are extended to the punch-holder in order to maintain accurate alignment.

When two or more presses are operated in a line, their treadles are connected by linkage, so that when one press is stopped, the others also stop. The presses are run at approximately the same speed, the last ones, however, running slightly faster. With this arrangement, no dam-



Drawn on Press Shown at Right, Then Blown through Chute B to Press at Left, where It Is Formed and Ejected into Another Chute

age is done in the event that a press is operated without work in its die.

A die with this feed arrangement will handle any kind of stamping work which can be fed through a chute, whether round or square, shallow or deep, or of relatively large or small size. It is only necessary to push the work into the centering jaws approximately close to the required position and it will be automatically centered. This prevents the punch from cutting into a partially entered stamping, as in the case of gravity chutes which carry the blanks directly to the die. Jamming of the die or feed rarely occurs, as previously mentioned, due to the spring action incorporated in the design.

The lateral feeding mechanism which pushes the work into the centering jaws by means of the spring-actuated slide that moves at right angles to the direction in which the stampings are fed through the chute operates rapidly and is practically trouble-free. The operating principle of the mechanism illustrated has been described as it is applied to most types of work. Certain modifications can be made to suit the requirements of special cases.

* * *

According to engineers of the Norton Co., when tiny surface cracks are encountered in grinding finished parts, it may be worth while to run some life tests under normal operating conditions to determine whether the cracks will be harmful in service. In this way, parts whose surfaces have become slightly cracked in grinding may not have to be rejected, which means a considerable cost saving.

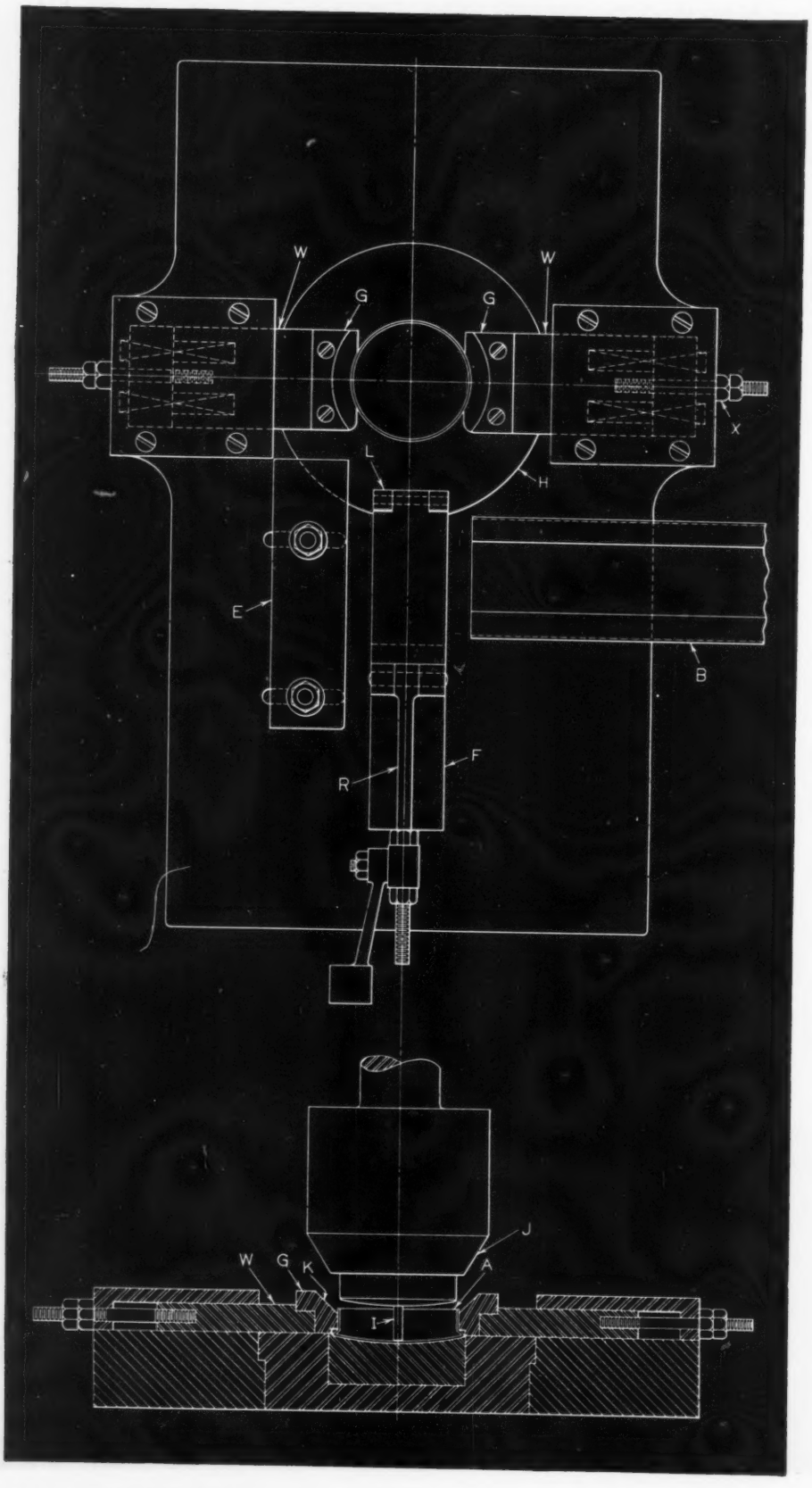


Fig. 2. Diagrammatic Plan and End Views of Principal Members of Die, Feeding Slide, and Work Locators of Press Shown at Left in Fig. 1

Tool Engineering Ideas

Tools and Fixtures of Unusual Design, and Time- and Labor-Saving Methods that Have been Found Useful by Men Engaged in Tool Design and Shop Work

Determining the Developing Angles for Circular Forming Tools

By FRITZ L. KELLER, Bloomfield, N. J.

Many toolmakers and designers consider it difficult to calculate the developing angles to which a circular forming tool should be ground to produce given cutting angles. This difficulty arises from the fact that developing angles, such as angle *D* in Fig. 1, are in a radial plane, while cutting angles, such as angle *F*, are in a plane located below the center of the forming tool in order to provide adequate clearance for the cutting edge.

To simplify the discussion, a straight V-shaped profile will be considered. It will be noted that, in Fig. 1, the depth of the vee, measured in the axial plane, is shown as *A*, and measured in the cutting plane, as *B*. It will also be noted that *B* is greater than *A;* in fact, *B* increases as the depth *C* of the cutting plane below the center of the forming tool increases. On the other hand, the width *F* of the vee is the same whether it is measured in the radial or the cutting plane. Thus, it can be seen that the cutting angle of the vee becomes smaller and the difference between it and the developing angle greater as the distance *C* increases.

In some cases, this difference in size between developing and cutting angles is of no consequence, since the profile of the work need not be formed to exact angles. For this type of work, the circular forming tool can be turned with the turning tool located opposite the center of the forming tool blank, the turning tool being made up to have the same angular profile as the work. In other words, the developing angles on the circular forming tool will be made equal to the desired angles on the work. Consequently, the cutting angles will be somewhat smaller than the angles called for, and slight errors will thus be introduced into the profile of the work.

Where the profile of the work must be formed to accurate angles, many toolmakers do not use a circular forming tool, but employ a so-called "dovetail" forming tool, and in this way, avoid the difficulty of computing developing angles. It also might be mentioned that a method of obtaining accurate cutting angles in circular forming tools without calculation, described in some textbooks, consists in setting the turning tool the same distance below the circular forming tool blank center as the cutting plane is to be ground below the center when the circular forming tool is finished. This method, however, is not entirely satisfactory, as the circular forming tool blank tends to spring upward while being turned and climb onto the tool.

The only satisfactory procedure is to compute developing angles which, when turned into the circular forming tool blank, in a radial plane, result in the desired cutting angles being produced in the cutting plane. A method of computing the developing angles is summarized in the accompanying table (see next page).

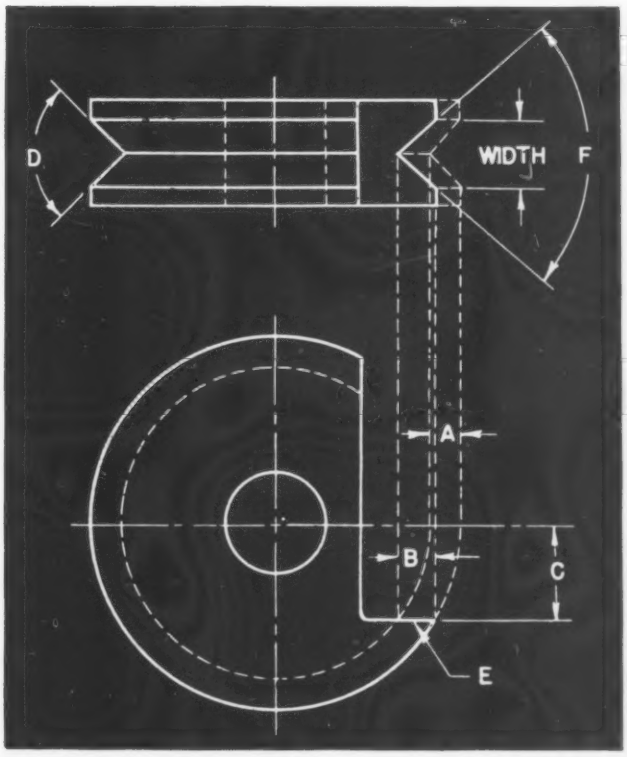


Fig. 1. Circular Forming Tool with V-shaped Profile. Angle D, which is Turned into the Forming Tool Blank in Radial Plane, is the Developing Angle. Angle F is the Corresponding Cutting Angle in the Cutting Plane E

Procedure for Finding Angles w and t Indicated in Fig. 2

The following dimensions and angles must be known:
A = smallest diameter of circular forming tool;
C = depth of cut below center;
N = axial dimension on work;
O = axial dimension on work;
T = size of impression angle in cutting plane;
W = size of impression angle in cutting plane;

Step	Find	Formula	Step	Find	Formula
1	B	$B = 0.5 \times A$	7	J	$J = O \cot W$
2	D	$D = \sqrt{B^2 - C^2}$	8	K	$K = D + J$
3	E	$E = N \cot T$	9	L	$L = \sqrt{K^2 + C^2}$
4	F	$F = D + E$	10	M	$M = L - B$
5	G	$G = \sqrt{F^2 + C^2}$	11	t	$\tan t = N \div H$
6	H	$H = G - B$	12	w	$\tan w = O \div M$

Three views of a circular forming tool that has a non-symmetrical V-shaped profile (the angles on each side of the center line of the vee being unequal) are shown in Fig. 2, together with the work-piece being formed. In the table, the dimensions and angles that must be known and the successive steps required to find developing angles t and w on each side of the center line of the vee are given. These are the angles which must be cut into the circular forming tool blank when it is being turned to produce the required angles T and W in the cutting plane. The following example illustrates the use of the table:

Example—Given the following dimensions and angles: $A = 3.000$ inches; $C = 0.312$ inch; $N = 0.171$ inch; $O = 0.314$ inch; $T = 42$ degrees 58 minutes; and $W = 44$ degrees 9 minutes. Find angles t and w.

1. $B = 0.5 \times 3.00 = 1.500$
2. $D = \sqrt{1.5^2 - 0.312^2} = 1.4672$ inches
3. $E = 0.171 \times \cot 42$ deg. 58 min. $= 0.171 \times 1.0736 = 0.1836$ inch
4. $F = 1.4672 + 0.1836 = 1.6508$ inches
5. $G = \sqrt{1.6508^2 + 0.312^2} = 1.680$ inches
6. $H = 1.680 - 1.500 = 0.180$ inch
7. $J = 0.314 \times \cot 44$ deg. 9 min. $= 0.314 \times 1.0301 = 0.3235$ inch
8. $K = 1.4672 + 0.3235 = 1.7907$ inches
9. $L = \sqrt{1.7907^2 + 0.312^2} = 1.8177$ inches
10. $M = 1.8177 - 1.500 = 0.3177$ inch
11. Tan $t = 0.171 \div 0.180 = 0.9500$
    $t = 43$ degrees 32 minutes
12. Tan $w = 0.314 \div 0.3177 = 0.9884$
    $w = 44$ degrees 40 minutes

Cam-Operated Air Vise

By MARK W. PURSER, Tenafly, N. J.

Many operations on drilling machines, such as drilling, counterboring, tapping, turning, or chamfering, can be performed faster, and handling time can be reduced to a minimum, by adaptations of the arrangement here illustrated, which was developed by the Farmingdale Aircraftsmen Mfg. Corporation, Farmingdale, N. Y. In this arrangement, a disk cam is installed on the pinion feed-shaft of the drilling machine to actuate an air valve that operates the work-clamping pneumatic vise on the table of the machine.

Such a cam-operated air vise is shown being used in a counterboring operation in the illustration. The

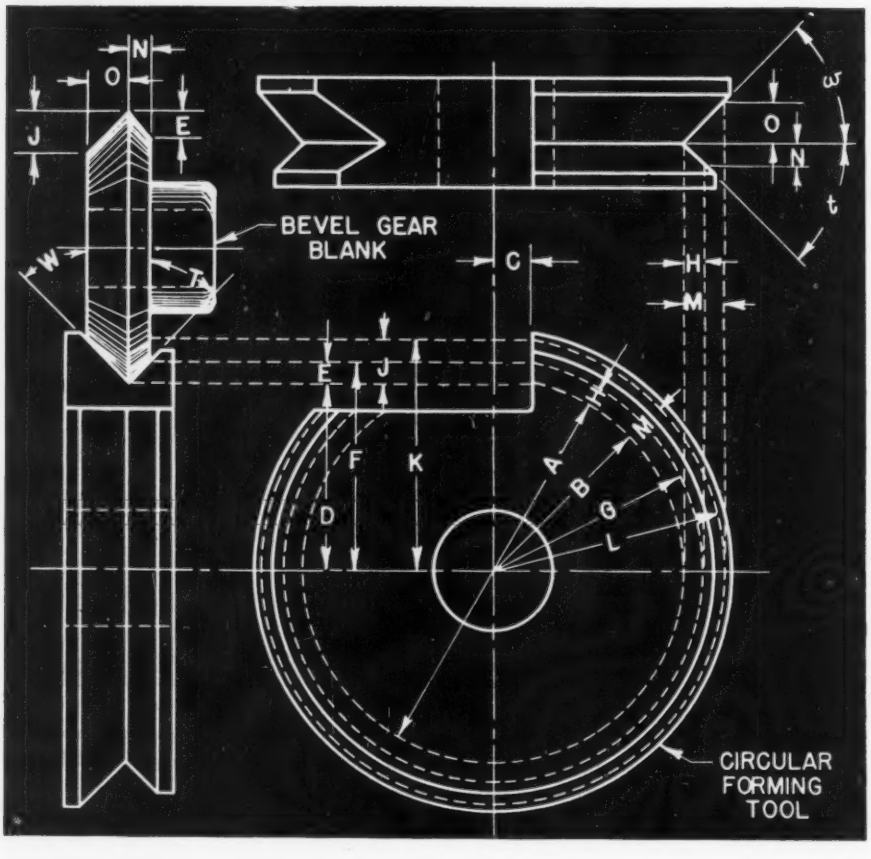
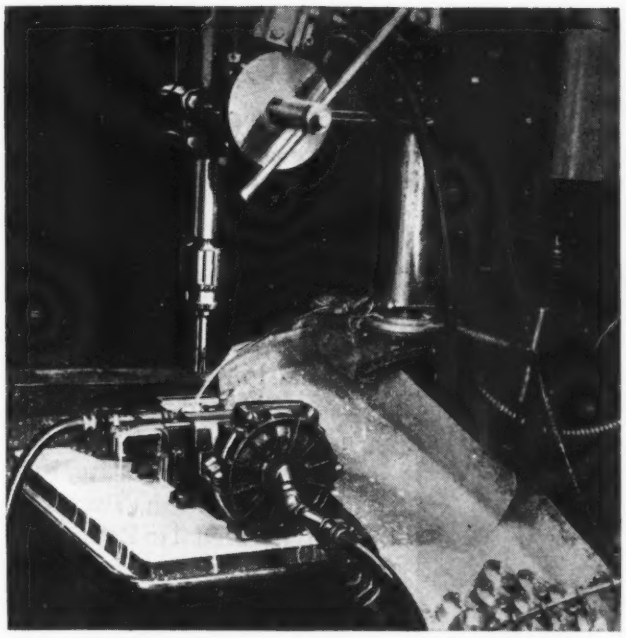


Fig. 2. Circular Forming Tool and Work, Showing Dimensions Needed to Find Developing Angles t and w Corresponding to Cutting Angles T and W by Procedure Outlined in the Table Above



Production on This Counterboring Operation has been Increased by Operating the Work-holding Air Vise by Means of the Disk Cam Shown Mounted on the Pinion-shaft of the Machine

work-piece is gripped in a split holding fixture which is attached to the jaws of the pneumatic vise. When the spindle of the drilling machine is lowered, the disk cam actuates the air valve shown at the top center and closes the vise. Upon the completion of the counterboring operation, when the spindle is raised, the cam causes the vise to open. The air thus exhausted is directed to a nozzle mounted in front of the fixture, which blows the completed part onto a chute. Thus, operation of the spindle feeds the tool, clamps or releases the work-piece, removes the work-piece from the fixture, and blows away any chips on the fixture or vise jaws.

Turning Thin-Walled Bushings with a Single-Point Tool

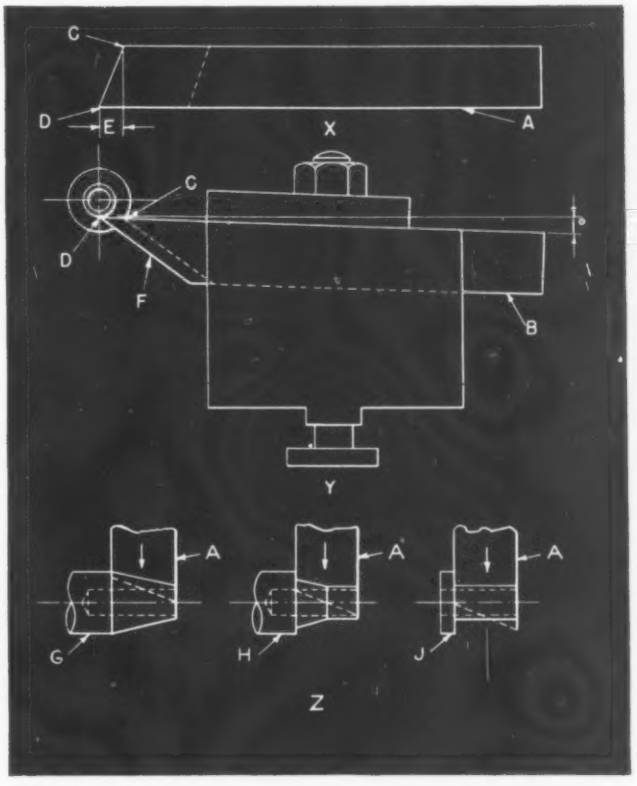
By DONALD A. BAKER, Boonton, N. J.

Turning thin-walled bushings or sleeves is a job that, when improperly tooled, often results in a large scrap loss. However, with a single-point, under-shot tool, either plastic or metal can be turned down to a wall thickness of 0.005 inch, if necessary.

This type of tool was used to machine the Lucite bushing shown in the accompanying illustration. The outside and inside diameters of the piece were 3/16 and 5/32 inch, respectively, leaving a wall thickness of only 1/64 inch. The job was set up in a light, hand screw machine, and tooled with a stop, center drill, drill, and reamer in the turret. For turning, an under-shot tool, which, in operation, passed completely under the work, was mounted on the cross-slide of the machine.

The turning tool was ground as shown by the top view *X* and the side view *Y* at *B*. The excessive front rake *F* was necessary to get free cutting action, although on brass this rake angle can be made much smaller. In addition, the top face of the tool was inclined at an angle of 1 degree toward the back of the lathe to give cutting clearance—a condition that left point *C* on the back edge slightly lower than point *D* on the front edge. As will be seen later, this necessitated grinding the top of the tool at a small angle to eliminate a taper on the bushing. The top angle can be figured from the difference in height of the two sides, which is equal to the sine of 1 degree times *E*.

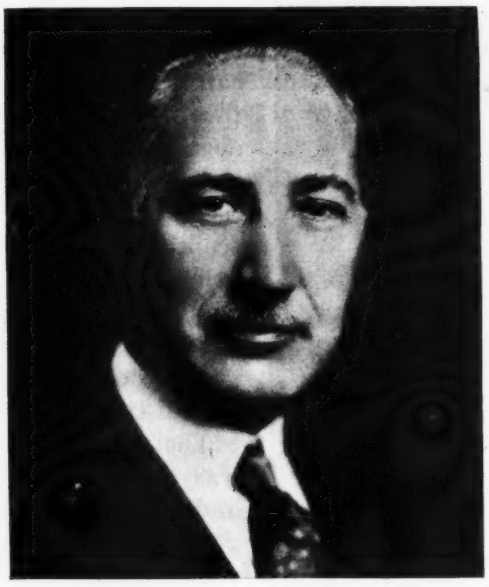
The cycle of operations of the screw machine was as follows: Center drill, drill, ream, turn, and cut off. View *Z* shows the tool *A* as it progressively turns the bushing down. The cutting action is such that the heavy cut always is on a heavy section; little pressure is exerted on the thin wall, and no pressure on the finished wall.



A Single-point, Under-shot Tool, Mounted in the Back Cross-slide of a Hand Screw Machine, was Used to Turn Bushings Having a Wall Thickness of 1/64 Inch

Annual Meeting of the American Society of Mechanical Engineers

THE 1947 annual convention of the American Society of Mechanical Engineers will be held in Atlantic City from December 1 to 5, inclusive, with headquarters at the Chalfonte-Haddon Hall. Technical sessions, covering practically every phase of mechanical engineering, will be held in the morning and afternoon of each day, with one evening session on Thursday, December 4. Luncheon and dinner speakers will include David Lilienthal, who will address the Nuclear Energy Luncheon on December 2; Fred S. McConnell, president of the National Coal Association, who will talk at the Fuels Dinner on the same date; and Alvin E. Dodd, president of the American Management Association, who will discuss "Productivity—Prices—Markets" at the Management Luncheon on December 4.



E. G. Bailey, New President of the American Society of Mechanical Engineers

Dr. Clark B. Millikan, director of the Guggenheim Aeronautical Laboratory of the California Institute of Technology, will review ten years of rocket research at a dinner on December 4. Dr. Werner von Braun, technical director of Germany's Peenemunde rocket research base during the war, will describe the development of the V-2 missile at the Rocket Luncheon on December 5.

Honorary membership will be conferred upon Everett G. Ackart, Wilmington, Del., retired chief engineer of E. I. du Pont de Nemours & Co.; Harvey N. Davis, president, Stevens Institute of Technology; Francis Hodgkinson, New York City, retired consulting engineer; General George C. Marshall, Secretary of State, Washington, D. C.; and Lord Dudley Gordon, president of the Institution of Mechanical Engineers (presentation made during I.M.E. Centenary celebration, June, 1947).

The A.S.M.E. Medal will be presented to Paul W. Kiefer, chief engineer, Motive Power and Rolling Stock, New York Central System; the Holley Medal to Raymond D. Johnson, Fort Lauderdale, Fla.; the Warner Medal to Arpad L. Nadai, consulting mechanical engineer of Westinghouse Research Laboratories, East Pittsburgh, Pa.; the Melville Medal to Raymond C. Martinelli, General Electric Co., Schenectady, N. Y.; the Spirit of St. Louis Medal to John K. Northrop, president, Northrop Aircraft, Inc., Hawthorne, Calif. (presentation made at the fall meeting, September, 1947); the Gantt Medal to Alvin E. Dodd, president, American Management Association, New York, N. Y.; and the Alfred Noble prize to Martin Goland, chairman, Engineering Mechanics Research, Midwest Research Institute, Kansas City, Mo. (presentation made at semi-annual meeting, June, 1947).

The newly elected president of the Society for the coming year, E. G. Bailey, has been a vice-president and director of the Babcock & Wilcox Co. since 1930. Mr. Bailey was the founder in 1916 of the Bailey Meter Co., Cleveland, Ohio, and is now chairman of the board.

Among Mr. Bailey's inventions, which are covered by more than one hundred U. S. patents and numerous patent applications, are fluid meters, boiler meters, automatic combustion controls, the water-cooled furnace wall, pulverized coal feeders and burners, boilers and furnaces. Mr. Bailey obtained his degree in mechanical engineering from Ohio State University in 1903. He has also received honorary degrees from that institution, as well as from Lehigh University and Lafayette College. Numerous awards and medals have been given to Mr. Bailey. He is a Fellow of the American Society of Mechanical Engineers, and a member of the American Institute of Mining and Metallurgical Engineers and of the Society of Naval Architects and Marine Engineers.

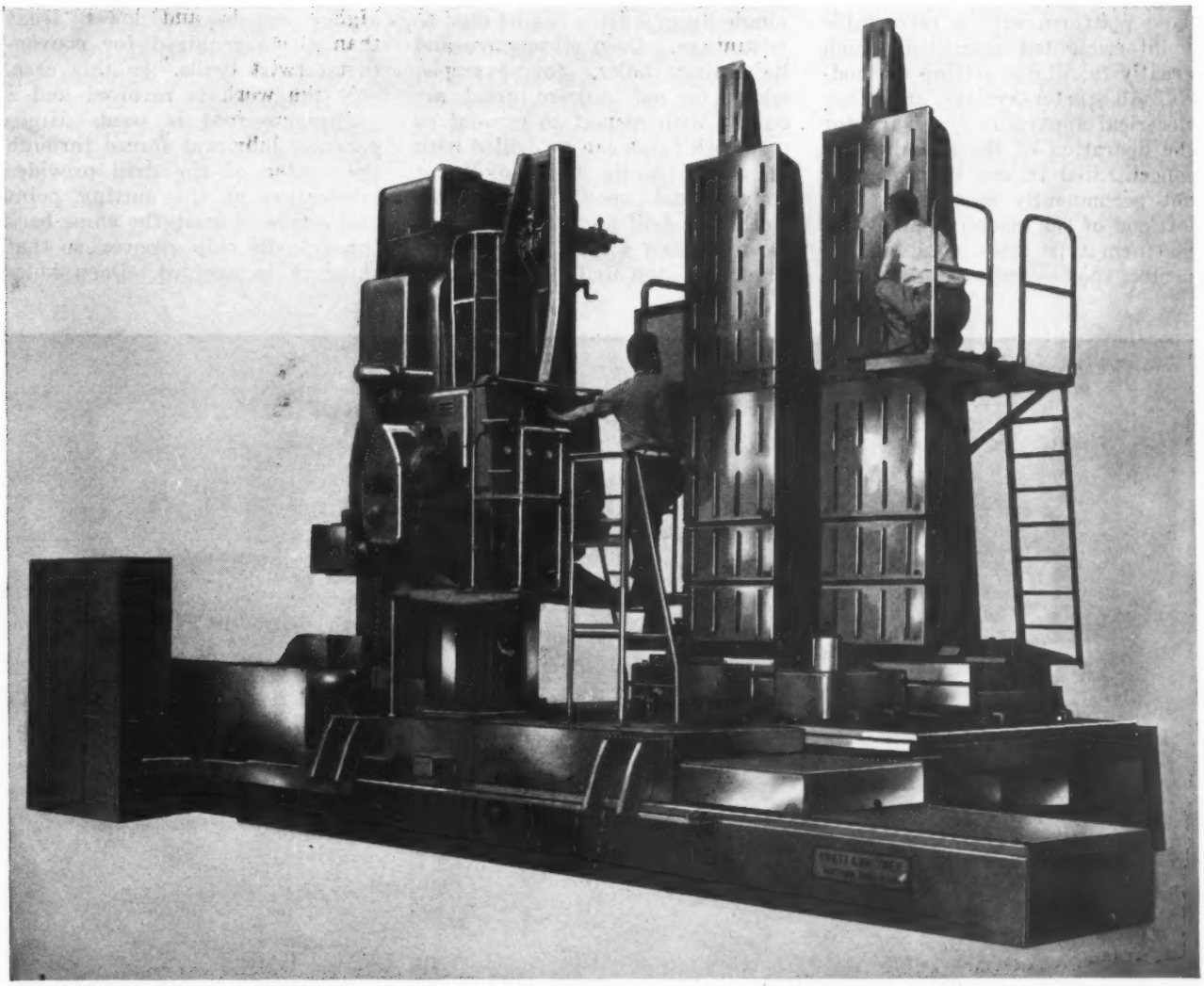
Shop Equipment News

Machine Tools, Unit Mechanisms, Machine Parts, and Material-Handling Appliances Recently Placed on the Market

Pratt & Whitney-Keller Tracer-Controlled Three-Dimensional Milling Machine

Automotive body dies up to 10 feet long by 5 feet high can be machined on the new Keller tracer-controlled three-dimensional milling machine recently announced by Pratt & Whitney Division Niles-Bement-Pond Co., West Hartford 1, Conn. Like other Keller machines, built in both smaller and larger sizes, this new Type BG-22 is controlled by a sensitive tracer and operated by simple electric circuits. It will accurately and automatically reproduce in metal the shape of a master form or model. This machine can be used either for profiling in two dimensions or for reproducing impressions and reliefs in three dimensions. In each case, as the tracer passes over the master form, the cutter duplicates its path precisely in the work.

The unique electrical control of the new machine provides continuous automatic speed variations, and permits machining from models at higher speeds and with greater accuracy than heretofore possible. The bed, column, counter-



Pratt & Whitney-Keller Tracer-controlled Machine Developed for Rapid, Accurate Production of Automobile Body Dies and Similar Work

To obtain additional information on equipment described on this page, see lower part of page 206.

weight arrangement, drive boxes, and other units are designed for fast, powerful, and continuous operation. An outstanding feature of the machine is the operating efficiency made possible by improved controls, which have been especially designed to reduce set-up time to a minimum.

Many improvements in design have been incorporated in both the mechanical structure and the electrical control system of the machine. For example, complete control of the machine from one main operating station on the spindle head is secured by concentrating all controls in one panel at this station. An upper platform or station is provided above the main station for the convenience of the operator when setting the tracer and when making other set-up adjustments. A panel of momentary electrical controls is also provided in the tracer bracket at the upper station.

Each angle-plate fixture has a fixed platform with a retractable counterweighted extension, which greatly facilitates setting up models. All starters, relays, and other electrical apparatus necessary for the operation of the machine are concentrated in one control cabinet permanently mounted at the left end of the machine end. Steel platform type telescoping guards protect the bearing surfaces of the bed. These guards are roller-mounted and move on tracks extending beyond the ends of the main bed of the machine.

The machine has a horizontal travel of 120 inches; a vertical travel of 60 inches; and a transverse travel of 18 inches, with an additional 6-inch travel obtained by means of the transverse spindle adjustment. The table working surface is 150 by 92 inches. There are fourteen spindle speeds ranging from 20 to 1200 R.P.M. The horizontal and vertical feed rates range from 1/2 inch to 30 inches per minute; horizontal and vertical fast traverse rates are 250 inches per minute; and transverse travel rates range from 3 to 30 inches per minute. The machine operates on any conventional polyphase 50- or 60-cycle alternating-current source of power, and requires a driving motor of approximately 15 H.P. It weighs about 50 tons with regular equipment and angle-plate fixtures. The dimensions are 30 feet long, 16 feet deep, and 18 feet high. 61

Natco "Holeunit" Deep-Hole Driller and Electronic Mechanical Feed Unit

The National Automatic Tool Co., Inc., Department 40, Richmond, Ind., has recently added to its line the horizontal deep-hole driller shown in Fig. 1. This machine has several unusual features, and is so constructed that standard two-lip twist drills or single-lip gun drills can be used to advantage. Deep oil-passage and lightening holes, for example, which do not require great accuracy with respect to run-out or a smooth finish can be drilled with standard two-lip twist drills at conventional speeds and feeds. Both the drill and the work are revolved, and a step feed cycle is used. In step drilling, the chips are removed by frequent withdrawal of the drill. Wherever size permits, oil-passage drills are used and lubricant at high pressure is applied to the drill point.

Deep holes requiring smooth finish and minimum run-out are drilled with single-lip gun drills at higher speeds and lower feeds than those required for conventional twist drills. In this case, only the work is revolved and a continuous feed is used. High-pressure lubricant forced through the center of the drill provides lubrication at the cutting point and serves to wash the chips back through the chip grooves, so that clogging is avoided. Deep holes

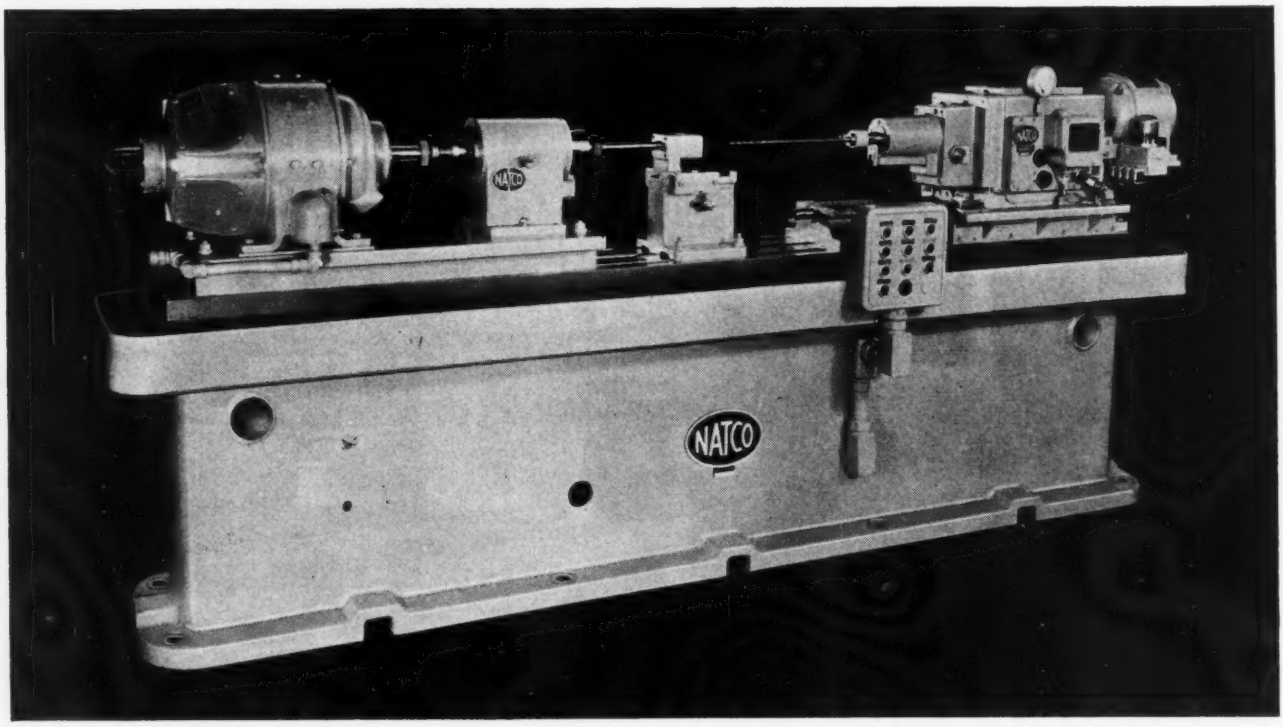


Fig. 1. Natco "Holeunit" Deep-hole Drilling Machine

To obtain additional information on equipment described on this page, see lower part of page 206.

requiring a reaming operation are finished with a standard reamer, only the reamer being revolved while a continuous feed is used. A master control station provides centralized operator control and selector switch control for set-up and cycling operations.

The Natco electronic unit shown applied to the machine illustrated in Fig. 2 is designed to meet the demand for a flexible, positive feed for use in drilling, reaming, boring, facing, and tapping operations. Positive performance and flexibility of set-up are features of this new unit. It is adaptable for use under a wide variety of working conditions. This unit has automatic work cycles, such as rapid traverse forward, cross-feed forward, fine feed forward, dwell, rapid traverse, and stop, or rapid traverse forward, feed forward, feed reverse, rapid traverse, reverse, and stop. Many other combinations of movements are obtainable.

A smooth, positive feed movement is imparted to the tool-slide by an anti-friction ball screw and nut assembly driven through a mechanical transmission by an electronically controlled variable-speed motor which makes possible any feed rate adjustment within the range of the machine. The slide is mounted on a wide-way base equipped with hardened and ground steel ways of the narrow guide style, which are automatically pressure-lubricated at each stroke.

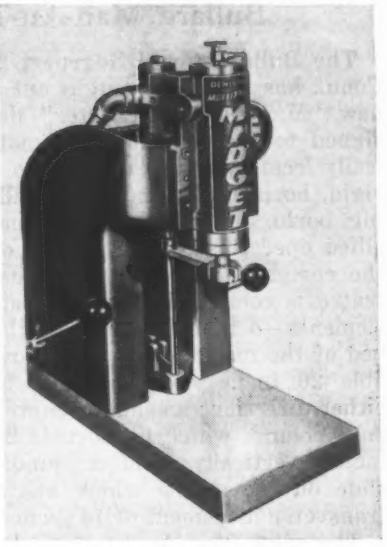
A spindle or combination of spindles in a head with a drive motor is mounted on the flat side of the machine. The head, of a style and size to suit the application, is driven directly through a flexible coupling by a 5-H.P. 1200-R.P.M. electric motor. A master control push-button station is provided on machines having two or more units. For routine operations, all unit cycles are initiated simultaneously; however, independent control is provided for set-up purposes. 62

Denison "Midget Multipress"

A "Midget" press designed especially for operations requiring between 200 and 2000 pounds ram pressure has been added to the line of "Multipresses" built by the Denison Engineering Co., 1152 Dublin Road, Columbus 16, Ohio. The high-production features of the larger "Multipresses" have been incorporated in this compact, small-size machine.

The "Multipress Midget" is especially suited for multiple or "gang" installations and for successive operations. One centralized power source will operate up to twelve units. When more than one "Midget" is used, each unit is equipped for individual pressure adjustment. The machine can be operated in any position, and is easily adaptable to other hydraulic machinery as an accessory unit for pressing, clamping, feeding, and other production work.

Three pumping units for operation in a series of four, eight, or twelve "Midget" units are available. 63



"Midget" Pressing Unit Brought out by the Denison Engineering Co.

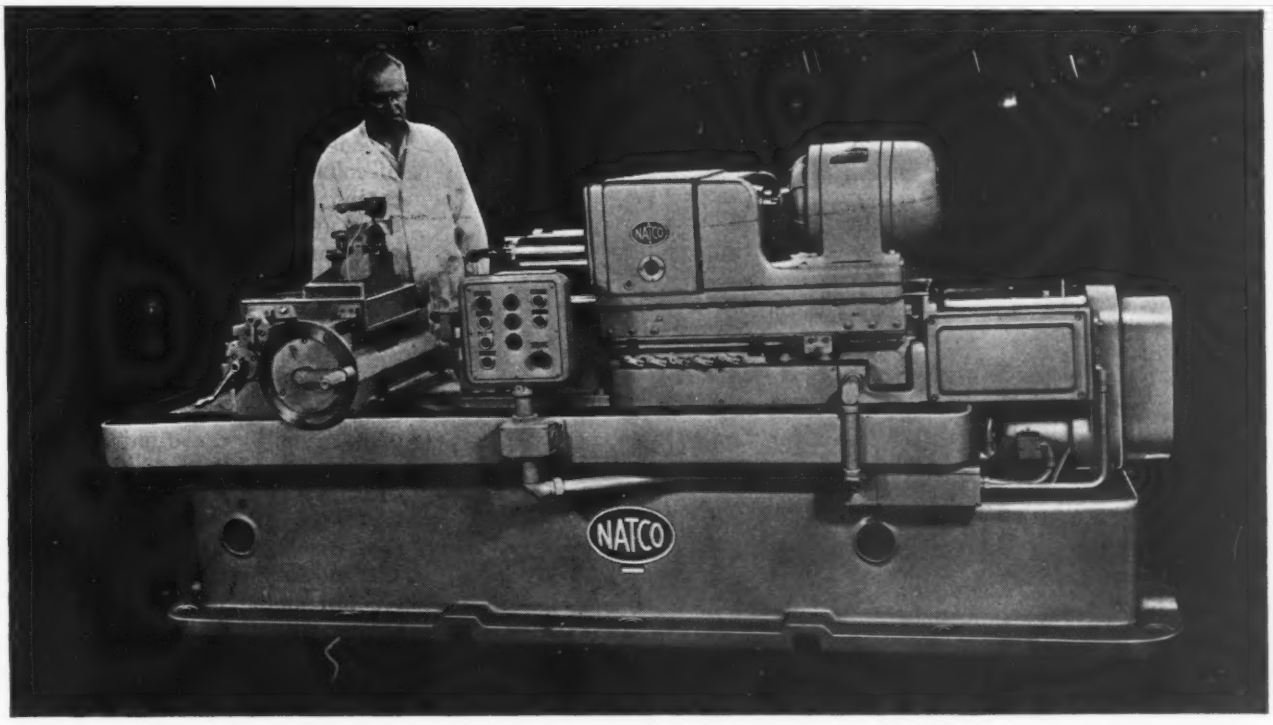


Fig. 2. Natco Machine Equipped with Electronic Feed Unit

To obtain additional information on equipment described on this page, see lower part of page 206.

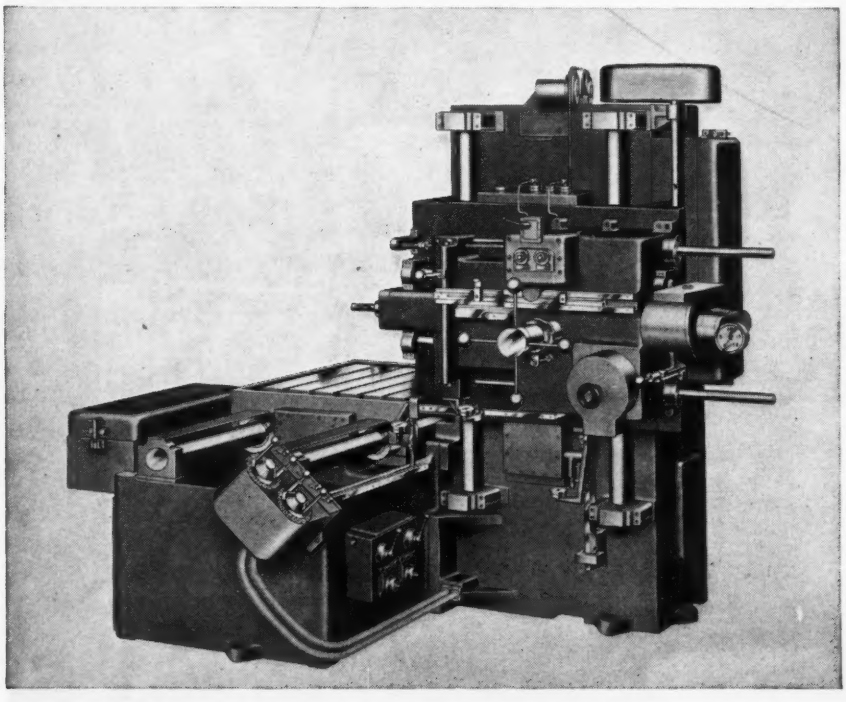
Bullard Man-Au-Trol Precision Locator

The Bullard Co., Bridgeport 2, Conn., has recently brought out a new "Man-Au-Trol Locator" designed to precisely and automatically locate work in relation to a rigid, horizontal spindle for drilling, boring, reaming, tapping, and allied operations. The locator of the compact 7-ton machine illustrated is composed of three basic elements—a table mounted on the bed of the machine which is movable 20 inches longitudinally in either direction; a saddle mounted on a column which is movable 20 inches vertically; and a spindle slide on the saddle which has a transverse movement of 16 inches.

The same Man-Au-Trol control used on the new Bullard three-spindle horizontal lathe and on the Man-Au-Trol vertical turret lathe have been applied to the machine illustrated. These controls, in conjunction with position stops set with integral measuring instruments, automatically control the relationship between the spindle and work. Once the stops are set, the work is located in the predetermined positions and in the proper sequence by means of dials.

There are twenty automatic stops for longitudinal positioning of the table, and twenty automatic stops for controlling the vertical motion of the saddle, giving a maximum potential of 400 positions in which the center lines for each operation fall upon common ordinates. The table, saddle, and slide can all be operated manually at any time. Automatic operation of the spindle slide is controlled from a panel on which adjustable dogs can be quickly set to accurately control the length of the traverse and the rate of feed. The automatic control is hydraulically operated, but a fully independent rack and pinion feed is available for hand operation.

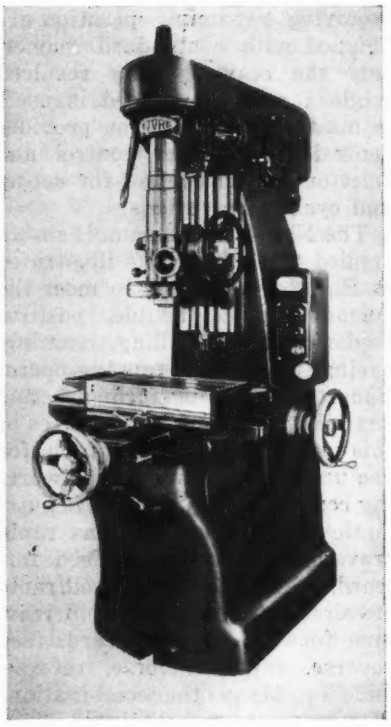
The spindle of the machine has an adjustment range of from 4 to 24 inches above the work-carrying table. An adjustable drive incorporating a two-speed transmission provides spindle speeds ranging from 84 to 2020 R.P.M. At constant torque, the speeds are from 14 to 84 R.P.M. Accessory indexing tables permit machining faces and holes in a multiplicity of planes at one setting. 64



Bullard Precision Boring, Drilling, and Tapping Machine Equipped with New "Man-Au-Trol Locator"

Moore Jig Boring Machine

A new jig borer designed for boring larger holes and taking heavier cuts than its preceding model, but employing the same principle of obtaining precise table settings, has been announced by the Moore Special Tool Co., Inc., 734 Union Ave., Bridgeport 7, Conn. This machine will bore holes up to 5 inches in diameter in mild steel or cast iron. It provides stepless, push-bottom controlled speeds within a range of from 90 to 2400 R.P.M., and has three power feeds of 0.0015, 0.003, and 0.006 inch per revolution of the spindle, which operates in either direction.



Jig Boring Machine of Improved Design Brought out by the Moore Special Tool Co.

Outstanding features include a tachometer for selecting spindle speeds; one-shot lubrication; a disconnect clutch for easy indicating; satin chrome finish on all dials and handwheels to eliminate glare and rust; a trip mechanism which prevents jamming of lead-screw nuts through over travel; and totally enclosed drive mechanisms. Hardened, ground, and lapped lead-screws provide for precise, rapid table settings within 0.0001 inch by coordinate location.

The table has a working surface of 10 by 19 inches, a longitudinal travel of 16 1/2 inches, and a crosswise travel of 10 1/2 inches. The minimum distance from table top to spindle end is 3 inches, and the maximum distance 18 inches. Vertical adjustment of the quill housing is 10 inches, spindle quill travel 5 inches, and distance from spindle center to column ways 10 inches. 65

To obtain additional information on equipment described on this page, see lower part of page 206.

Versatile Hydraulic Press Built by the Acme Broach Corporation

Acme Hydraulic Machine for Broaching, Horning, and Straightening

A 6-ton versatile type hydraulic broaching press has been developed by the Acme Broach Corporation, E. Third St. at Delaware, Lexington 47, Ky. This press is equipped with a table, as shown in the accompanying illustration, for broaching or forcing operations but it can be made to serve as a horning press by removing the table or as a straightening press by employing various types of tables.

Flexible control of the machine is afforded by a hand-lever or foot-pedal, the hand-lever being adjustable to suit the operator. Heavy column construction and a ground-steel work-plate, approximately twice as large as previously provided on machines of this size, serve to eliminate deflection and insure accurate work. A simplified, easily accessible hydraulic system and a readily accessible motor, mounted inside the column, are features of this new machine.

The press has a normal working capacity of 6 tons and a maximum working capacity of 8 tons. The stroke is 24 inches, and the maximum space between work-table and ram, 30 inches. The throat depth from center of ram to frame is 9 inches, and from center of ram to knock-off shaft, 7 3/4 inches. The ram has a down speed of 26 feet per minute and an up-speed of 36 feet per minute. The work-plate has a bore of 3 inches. A 5-H.P., 1200-R.P.M. motor is required. The coolant reservoir has a capacity of 10 gallons and the hydraulic tank holds 25 gallons. The complete machine weighs 3600 pounds. 66

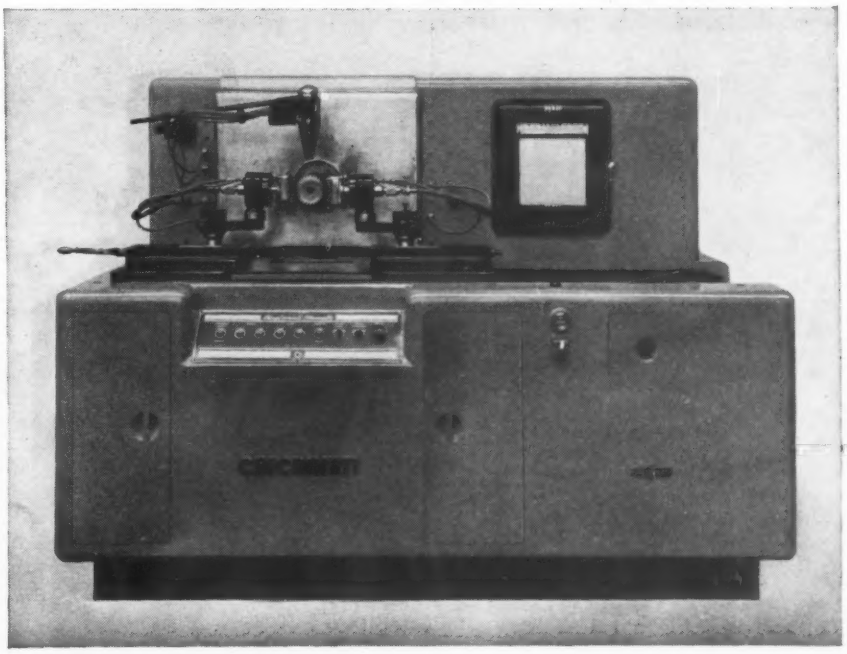
Cincinnati "Flamatic" Hardening Machine

A new development known as the "Flamatic" hardening machine, employing flames for surface-hardening of parts in production quantities, has just been announced by the Cincinnati Milling Machine Co., Cincinnati 9, Ohio. The machine incorporates many new improvements in flame-hardening techniques, and is said to hold parts within dimensional tolerances and to metallurgical specifications previously considered impractical with the flame-hardening method.

The most important feature of the "Flamatic" machine is the electronic temperature control system, which permits rapid heating of parts to the desired preset temperature, followed by an oil quench. It is claimed that the surface temperature at the instant the part enters the quench is held to within ± 5 degrees F. of the desired value in the critical transformation range.

Low initial equipment cost, fast and economical operation, and adaptability to parts in a wide variety of shapes and sizes are advantages claimed for the new surface-hardening machine. Rapid heating makes it possible to confine the heat to the surface of the part, leaving the core relatively cool and permitting the core properties to be established by previous heat-treatments. The uniform depth of heat penetration obtained, combined with the oil quench, is said to result in negligible distortion.

Equipped with standard flame heads, the machine is unusually adaptable, and has been used successfully to harden gears, shafts, barrel type cams, pinions, and other parts that lend themselves to rotation. With special flame heads and work-holding fixtures, the machine will accommodate a wider range of parts. In general, the range includes shafts up to 18 inches long and parts with diameters up to 8 inches having correspondingly shorter lengths. Operation of the machine is fully automatic except for loading the parts. The machine is 7 feet 8 1/2 inches wide by 5 feet 5 inches deep, and weighs 8500 pounds...67



Cincinnati "Flamatic" Hardening Machine with Electronic Temperature Control for Surface-hardening of Parts in Long Production Runs

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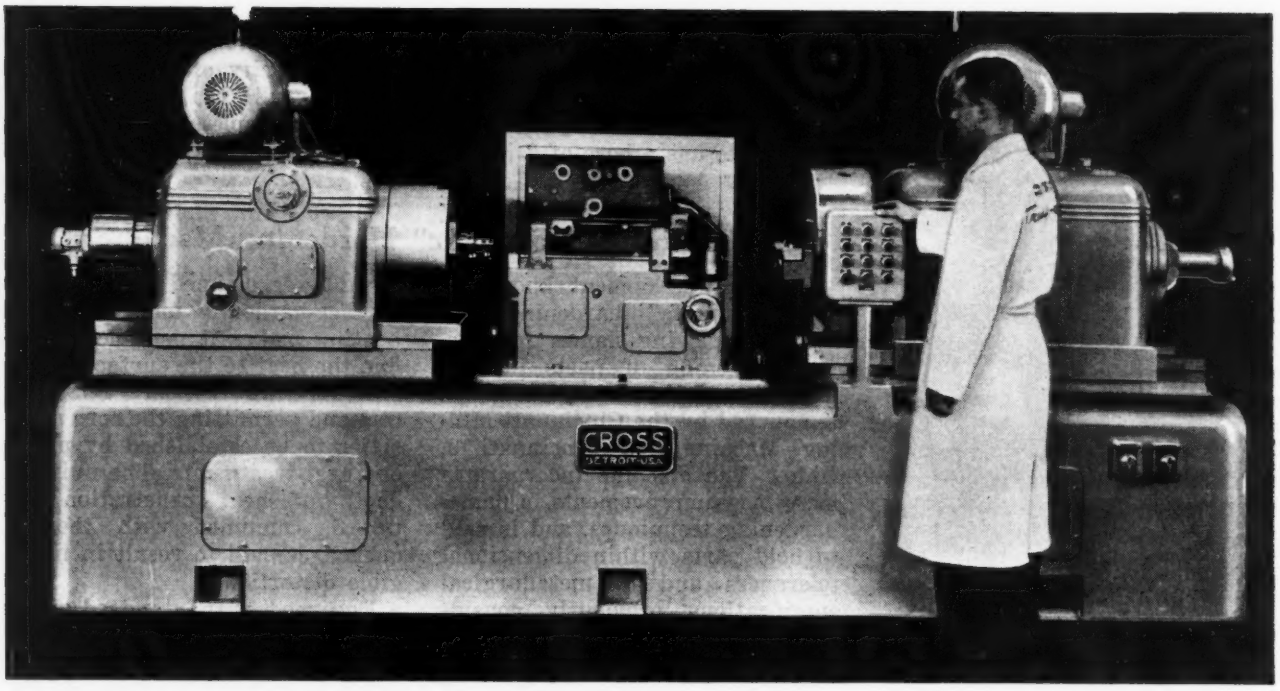


Fig. 1. Cross Special Machine Developed to Perform Four Finishing Operations on Cylinder Blocks

Cross Special Machines Developed for Machining Operations on Cylinder Blocks

The special machine shown in Fig. 1, designed to combine four finishing operations on a cylinder block on which the clutch housing has been assembled, is a recent development of the Cross Co., Detroit 7, Mich. This machine simultaneously finish-bores, chamfers, and faces the clutch housing and straddle-mills the thrust faces of the rear end main bearing. It has been especially developed to obtain more economical production and higher quality work, and has a production of forty-one parts per hour.

Standard carbide-tipped tool bits are used for all machining operations in place of milling cutters. Both loading and clamping are effected by power, and the machining cycle is automatic. All traverse and feed movements are hydraulically operated. Push-button controls are conveniently located in a central station.

A bar feed movement through the center of the right head is employed for boring and chamfering. Facing is done by cross-movement of a slide mounted on the same head. As the head revolves, the facing tool is fed out to produce a

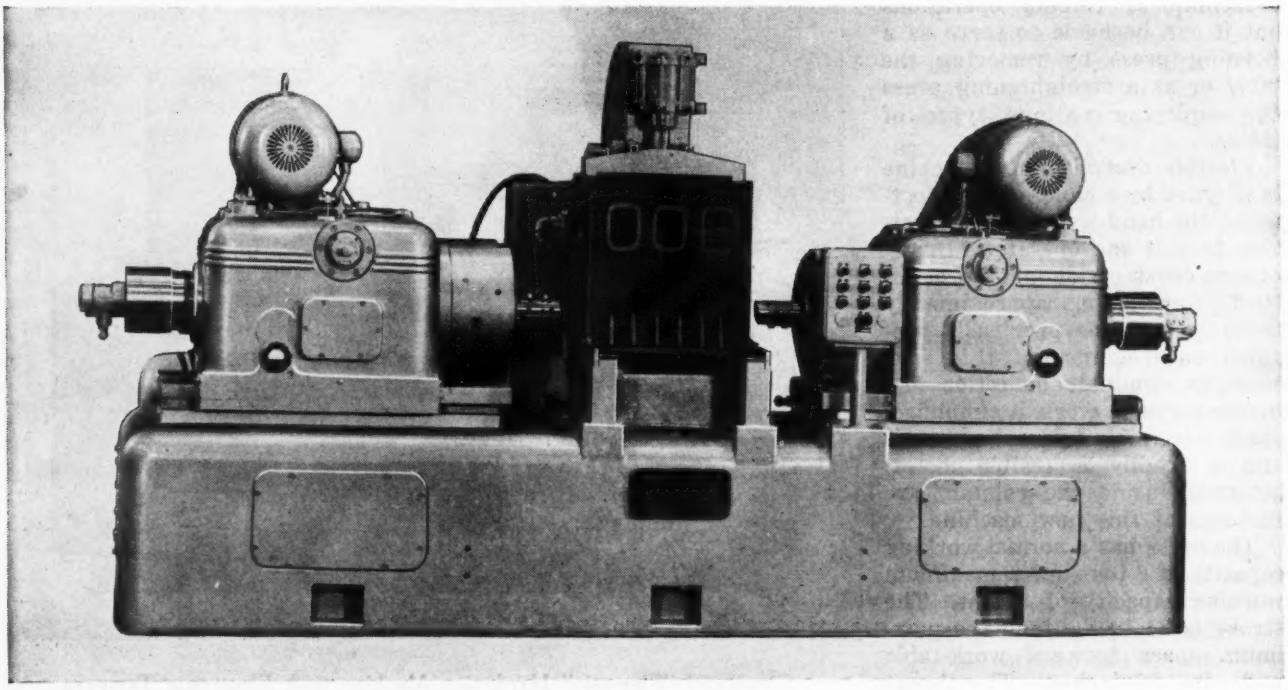


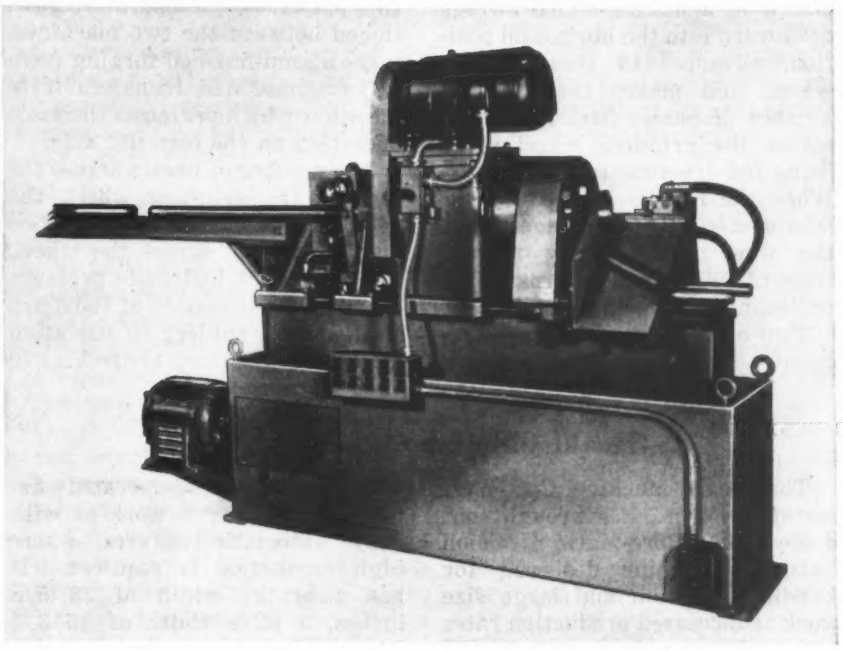
Fig. 2. Machine Developed by the Cross Co. for Straddle-facing Main Bearings of Cylinder Blocks

To obtain additional information on equipment described on this page, see lower part of page 206.

"phonograph record" type of finish, which is said to provide for better seating of the gasket in the final assembly operation.

The straddle-facing operation is performed at the left, by means of two tools mounted in a tool-holder and operated by the cross-slide. Here dual feed rates are utilized. As the head rotates, the tools are fed out to turn the work to a predetermined diameter during the roughing cut, and then fed back at one-half the original rate for finishing.

The machine shown in Fig. 2 is another recent development of the Cross Co., designed for facing the main bearings on Diesel-engine cylinder blocks. This new machine utilizes carbide-tipped tool bits, of which two are mounted in each holder. In operation, the heads advance rapidly into the cutting positions; then the revolving bars carrying the tools feed outward at the rate of 0.012 inch per revolution for the roughing cut, after which they feed back at the rate of 0.006 inch per revolution for the finishing cut. The work is located and clamped by power and machined automatically, the operator simply pressing the control buttons. Production is at the rate of forty-one cylinder blocks per hour. 68



Pines Automatic Pipe and Tubing Cut-off Machine

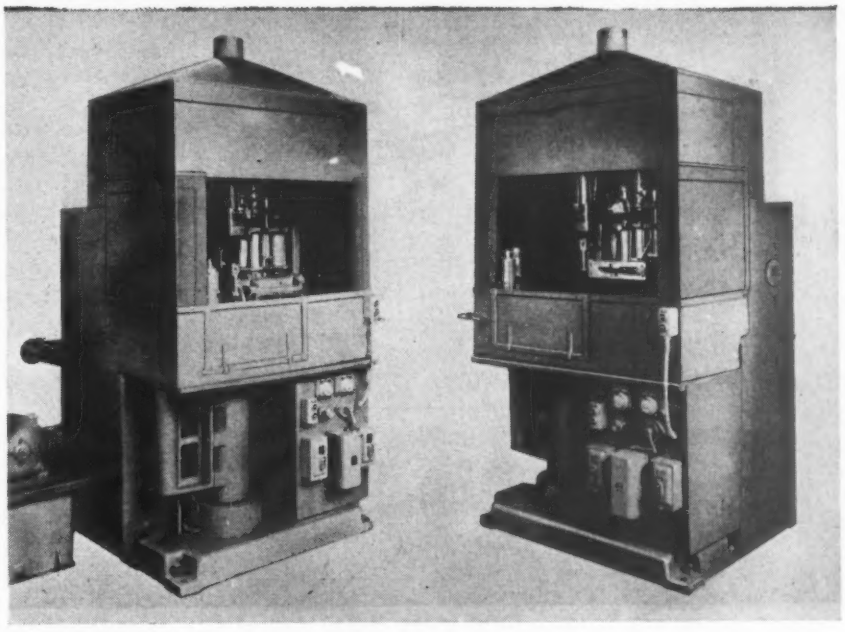
Pines Automatic Cut-Off Machine

A new cut-off machine designed for the accurate cutting of pipe and tubing to predetermined lengths at a high production rate has been added to the line of tubular metal-working equipment manufactured by the Pines Engineering Co., Inc., Aurora, Ill. This machine is fully automatic, the work being fed by motor-driven rolls through a hollow spindle and against an adjustable receding stop. A rotating head automatically cuts off the work, producing a square face and holding the end-to-end length within a few thousandths inch of the required dimension. The head is tooled to produce a clean cut, with a minimum of burrs.

A production rate of 1500 pieces per hour is possible, depending on the composition of the stock, wall thickness, and diameter. Once the machine is started, the operation is continuous until the machine runs out of stock. The time required to complete an entire machine cycle is 1 1/2 seconds. The spindle inserts and collets can be changed in a few minutes, and the tool-holders permit rapid adjustment to suit the work diameter. Either parting tool bits or rotary cut-off disks can be employed. Uncut stock can be placed manually on the feed-rolls or a power-driven conveyor with selector can be furnished to supply the feed-rolls directly from the guide rails of a storage rack. 69

Besly Vertical-Spindle Hydraulic Shear and Cutting Tool Grinder

Charles H. Besly & Co., 118-124 N. Clinton St., Chicago 6, Ill., recently introduced a new type vertical-spindle, fully hydraulic grinder, designed for grinding the faces of shears, chisels, plane bodies, scissors, and cutlery. The work or forging to be ground is



Besly Vertical-spindle Hydraulic Reciprocating Cutter or Knife Grinders

To obtain additional information on equipment described on this page, see lower part of page 206.

placed in a fixture which swings downward into the horizontal position, advances to the grinding wheel, and makes the required number of passes back and forth across the grinding wheel while being fed downward mechanically. When the feed is stopped by the micrometer-adjusted stop-screw, the work automatically recedes from the wheel and returns to the unloading and loading position.

Two of these machines are frequently used on production work. In such cases, the operator, positioned between the two machines, takes a semi-finished forging from one machine and transfers it to the other which performs the same operation on the opposite side.

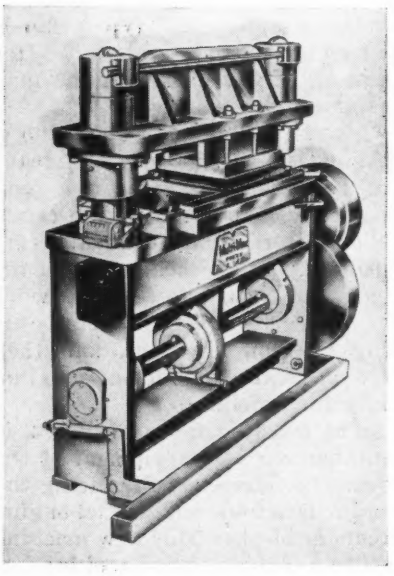
The number of passes across the face of the grinding wheel, the speed at which the work passes back and forth across the wheel, the amount of hydraulic pressure exerted, and the speed of the down feed are all subject to variation under the operator's control.....70

Heald Single-End Bore-Matic

The Heald Machine Co., Worcester 6, Mass., has brought out a Model 321 Bore-Matic precision finishing machine designed for handling medium and large size work at increased production rates and with greater accuracy and improved finish. This machine can be arranged for single or multiple spindles. It is extremely versatile, being adaptable for rough- and finish-boring, turning, facing, grooving, or fly-cutting. The new Bore-Matic is intended for mass production of a single part requiring several operations or for single or multiple operations on more than one part simultaneously.

This machine can be equipped with simple, hand-operated fixtures for short-run work or with fully automatic fixtures where high production is required. It has a bridge width of 23 5/8 inches, a table width of 16 3/4 inches, and a maximum table travel of 20 inches. The fast infeed is at the rate of 1/2 inch to 50 inches per minute; the slow feed range, from 1/2 inch to 40 inches per minute; and the rapid traverse of the table, 23 feet per minute. The machine, with separate cutting fluid tank, requires a floor space of 81 by 62 1/2 inches, and weighs 5350 pounds. The head is driven by a 5- or 7 1/2-H.P. 1800-R.P.M. motor...71

Bore-Matic Precision Finishing Machine Brought out by Heald Machine Co.



"Multi-Max" Combination Shear and Press

"Multi-Max" Combination Shear and Press

The Parker Mfg. Co., 2200 Colorado Ave., Santa Monica, Calif., is now manufacturing a 30-ton combination shear and press known as the "Multi-Max." This mechanically operated press will shear, blank, notch, punch, perforate, slot, pierce, lance, bend, and form sheet-metal parts in single or multiple units. It needs no special foundation, and can be operated by one man. The press has no overhanging parts and requires a floor space of only 36 by 75 inches. Because of its small compact size, it is easily picked up and moved in and out of the production line as needed, so that finished parts are fabricated right at the point of assembly, thus saving long runs, large inventories of parts, handling and stacking costs, and valuable floor space for storage.

The "Multi-Max" machine is of steel plate welded construction. It has a stroke of 2 inches and a ram adjustment of 2 inches. The shut height is 10 inches with the stroke down and the adjustment up. The bed die space is 12 by 36 inches; the ram die space, 10 by 36 inches; and the bed opening, 5 by 32 inches. A 1 1/2-H.P., three-phase motor is furnished with each press, which is capable of operating the machine at the rate of 100 strokes per minute. The height of the machine is 57 inches, and the weight, 3250 pounds. 72

To obtain additional information on equipment described on this page, see lower part of page 206.

Baldwin-Tate-Emery Material Testing Machine

A new type of Baldwin-Tate-Emery testing machine, announced by the Baldwin Locomotive Works, Philadelphia 42, Pa., was recently demonstrated at the plant of the A. H. Emery Co., Stamford, Conn. This machine has a maximum capacity of 5000 pounds, and is designed primarily for the precision testing of non-ferrous metals, plastics, and similar materials.

Distinguishing features of this machine are its continuously variable 400 to 1 positive speed range; horizontal rigidity; elimination of backlash; and high accuracy, even in the lowest speed ranges. Unlike the larger capacity Baldwin-Tate-Emery machines which employ hydraulic loading systems, this machine uses a mechanical screw system. The loading cross-head is driven by two screws which pass through nuts in the cross-head. These screws are rotated by a 1 to 1 or 10 to 1 gear transmission driven by a variable speed motor with General Electric Thy-motrol control. The speed of loading is variable from 0.05 inch to 20 inches per minute, and can be held constant within $\pm$ 2 per cent.

In the weighing system the Emery capsule, employed in most Baldwin testing machines, is replaced by a 100 to 1 mechanical compound lever using flex plates instead of the conventional knife-edges at the load points and fulcrums. The specimen is pulled, compressed, or flexed at the short lever end. The long end operates the force balance mechanism of the indicating system. 73

Automatic Screw Machine

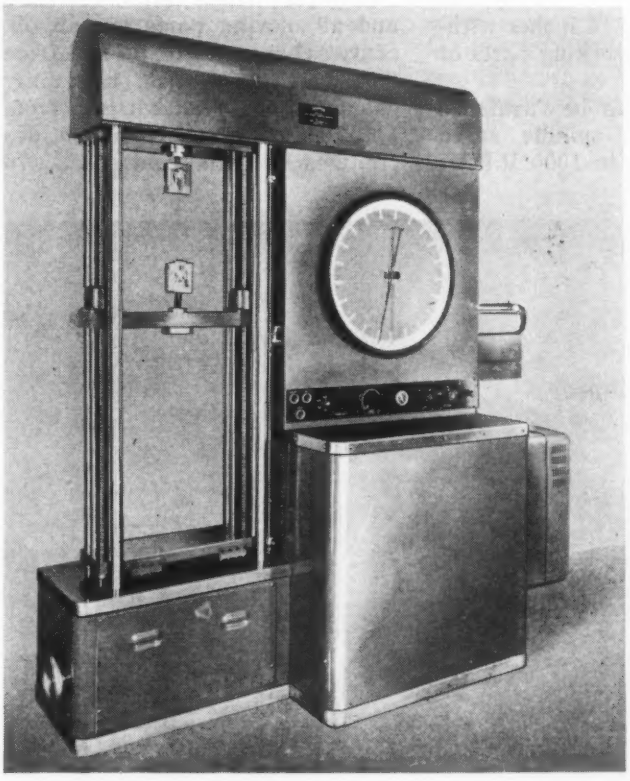
A compact automatic screw machine developed by the Standard Machinery Co., 1541 Elmwood Ave., Providence, R. I., for the production of bullet jackets during the war has now been redesigned for regular high-production work, performing all normal screw machine operations, with the exception of thread cutting, on stock up to 1 inch in diameter. The basic unit, arranged for mounting on a bench, is shown in the illustration. Regular equipment includes a 1 1/2-H.P. motor with manual starter and a motor sheave arranged for a spindle speed of 900 R.P.M., unless otherwise specified.

The stock machine provides for instantaneous advancement of bar materials up to 4-inch lengths. Special work feeds as long as 9 inches have been provided. Parts produced in preliminary operations, including cutting off, can be transferred by hopper into an automatic feed for an adjoining machine set up to accommodate additional operations. A signal light indicates when the stock has run out and the tool feed is automatically disengaged.

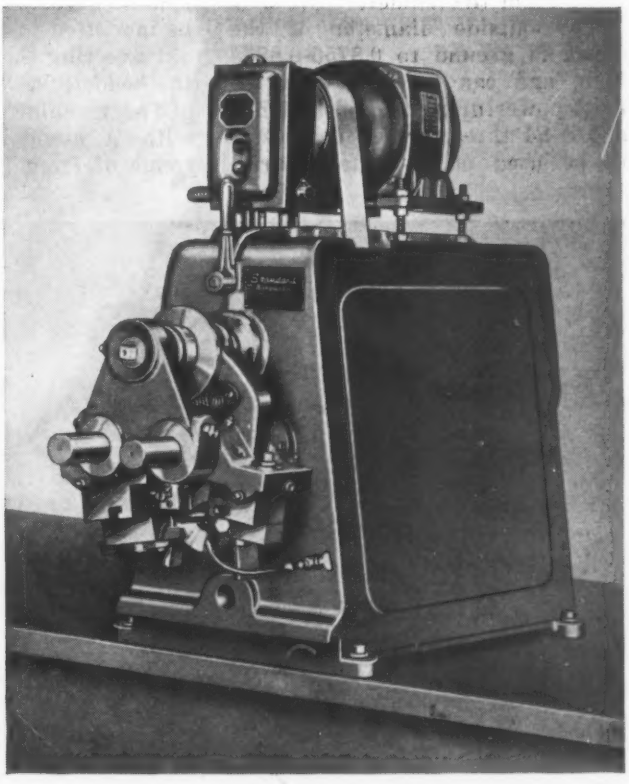
Advantages claimed for the new machine include quick chucking breaker designed on principle of and camshaft speed-up; chip-harmonic vibration; and provision for making all tool settings and cam and control adjustments at the front of the machine.

Multiple units can be set up with a space of 24 inches between spindle centers for bench mounting. In battery installations, an automatic chip and work conveyor with central cooling system can be provided. A battery of six machines can be handled by one operator, including the feeding of stock and tool maintenance.

The attachments available as special equipment, which can be



Precision Materials Testing Machine Brought out by the Baldwin Locomotive Works



Automatic Screw Machine Unit with Motor Drive, Built by the Standard Machinery Co.

To obtain additional information on equipment described on this page, see lower part of page 206.

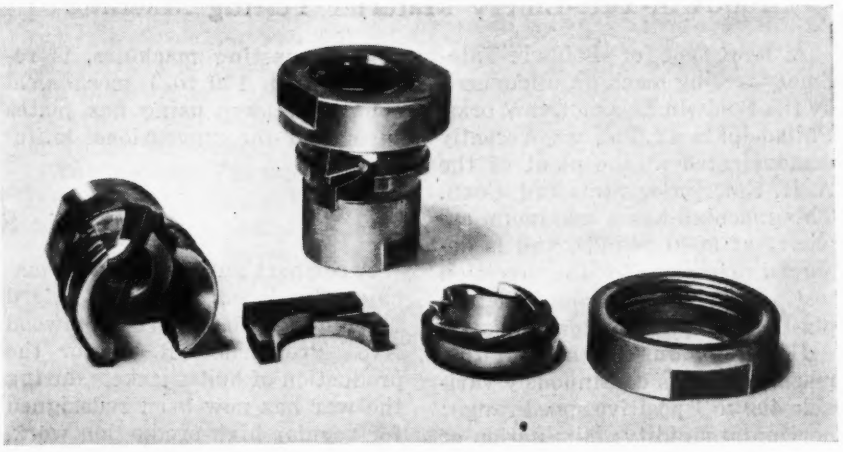
applied directly to the basic unit without alterations, include a drilling or boring tool actuated by an extra cam, stock stop, and steady-rest. A fabricated steel base, integral coolant tank, motor-driven coolant pump, and removable splash guards are furnished for single-unit installations. 74

Porter Electrode-Tip Dresser

The C. O. Porter Machinery Co., 666 Front Ave., N. W., Grand Rapids, Mich., has introduced on the market an electrode-tip dresser for use in the resistance welding field, which makes possible rapid precision dressing of worn electrode points. This tool is adaptable for dressing electrode tips for portable welding guns, short-stroke stationary welders, and multiple-point welders.

The outstanding feature of the new dresser is a cutter blade of extremely hard "Tan-Tung" steel which is free to float in the chuck body, providing uniform cutting action on both edges and correct centering of the electrode as the tip is reshaped. The compact construction permits worn electrodes to be dressed without removing them from the welder.

The outside diameter of the chuck is ground to 0.8755-0.8765 inch, and can be press-fitted in most power dressing tools. It has a 3/8–24 thread which enables it to be used on a portable drill, drill press, or lathe. A high-speed steel cutter ring is also incorporated in the tool for dressing the outside surface of the electrode to the proper diameter before the actual tip-dressing begins. 75



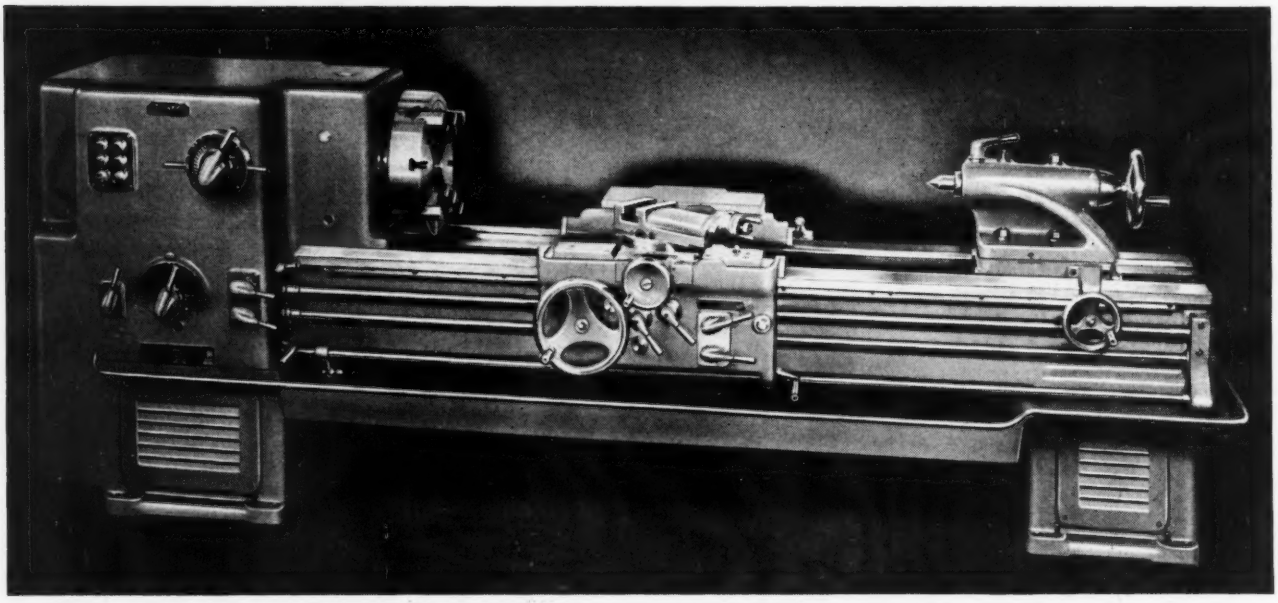
Electrode-tip Dresser Brought out by the C. O. Porter Machinery Co.

Sidney Engine Lathe

The Sidney Machine Tool Co., Sidney, Ohio, has brought out a new 18-inch engine lathe equipped with herringbone-gear headstock having thirty-two pre-selective spindle speeds. The spindle and long intermediate shafts are supported by anti-friction center bearings, in addition to the conventional end bearings. The standard spindle bore of 1 13/16 inches can be increased to 3 3/4 inches without affecting the working parts of the headstock.

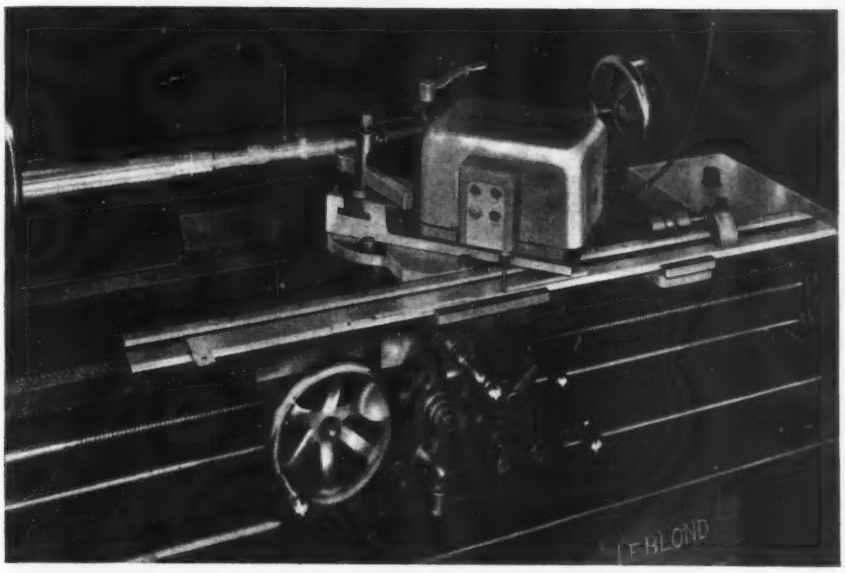
The machine can be furnished with a standard spindle speed range of from 13 to 1000 R.P.M. or an optional range of 19 to 1500 R.P.M. The spindle is mounted in such a manner as to automatically compensate for expansion caused by a rise in temperature. The transmission is so designed that the thirty-two spindle speed changes are made available through the use of only sixteen herringbone gears.

The gear-box is totally enclosed, and all moving parts run in oil. Sixty changes of feeds, from 0.0028 to 0.174 inch, and sixty changes for thread cutting, from 1 1/2 to 92 threads per inch, are obtained by a dial control. 76



Sidney Engine Lathe Equipped with Herringbone-gear Headstock

To obtain additional information on equipment described on this page, see lower part of page 206.



Front View of the LeBlond Electric Contouring Device, Showing Templet, Templet Bar, Stylus Pointer, Micrometer Adjustment, Bed Bracket, Push-button Control, and Finished Work Located between Centers

LeBlond Electric Contour Duplicating Device for Lathes

An electric contouring device designed to duplicate work accurately, automatically, and quickly, which can be installed on any LeBlond Regal lathe in ten minutes time, has been announced by the R. K. LeBlond Machine Tool Co., Cincinnati 8, Ohio. Power for operating this new device can be obtained by plugging into a light socket. It will perform a wide range of duplicating operations accurately within 0.0015 to 0.002 inch, including straight facing and turning, taper turning of any kind, necking and turning shoulders, and machining concave, convex, and spherical surfaces. It is readily adaptable to duplicating work between centers or profile facing.

The duplicator slide swivels on both sides of the cross-slide center line, permitting the tool to be fed toward either the headstock or tailstock. A constant distance is maintained between the tool and templet, since the templet bar is part of the tool-slide and moves in and out with the tool. The diameter is thus controlled by the regular cross-feed screw.

Three electric push-buttons controlling the in, out, and automatic cycle simplify the operation of this device, which is said to require no special skill. Since the LeBlond duplicator can be quickly installed or removed, it does not interfere with the normal operation of the lathe. The slide on which the duplicator is mounted is interchangeable with the standard Regal top slide, no machining, drilling, or fitting being required. 77

Multi-Point Spot-Welder and High-Production Projection Welder

The Federal Machine & Welder Co., 18 Dana St., Warren, Ohio, has developed a new type multi-point welder (Fig. 1) for spot-welding front fender stampings to fender rails. As set up in an automobile plant, two left fender welders and two right fender welders provide a production in excess of forty welded assemblies an hour per machine.

The fabricated steel main frame of the machine supports the stationary die unit and houses the welding transformers, clamping cylinders, and sequencing control. The fabricated steel clamping arm, which holds the spring-loaded point body units, is actuated by

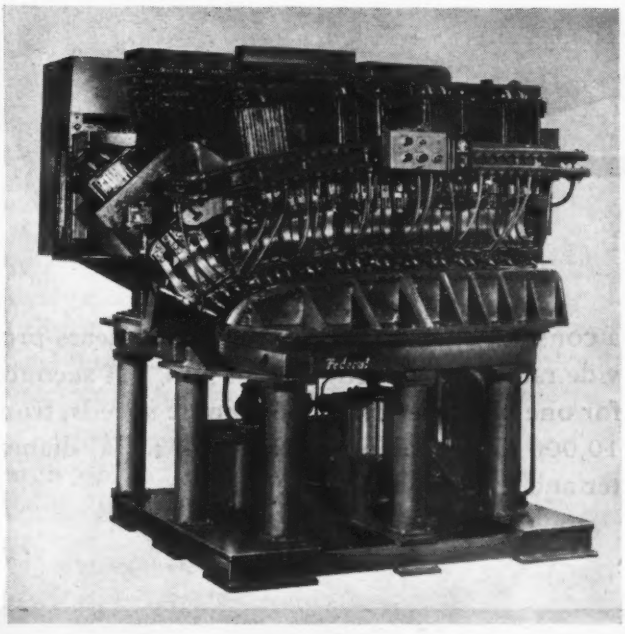


Fig. 1. Federal Multi-point Spot-welder

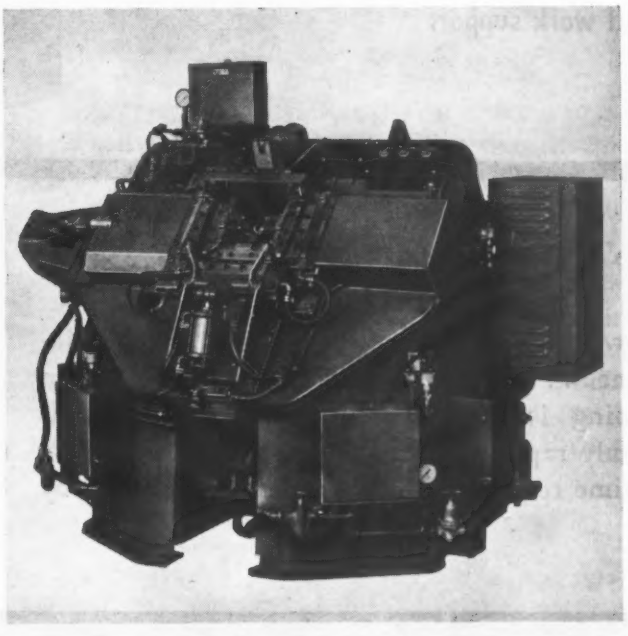


Fig. 2. High-production Federal Projection Welder

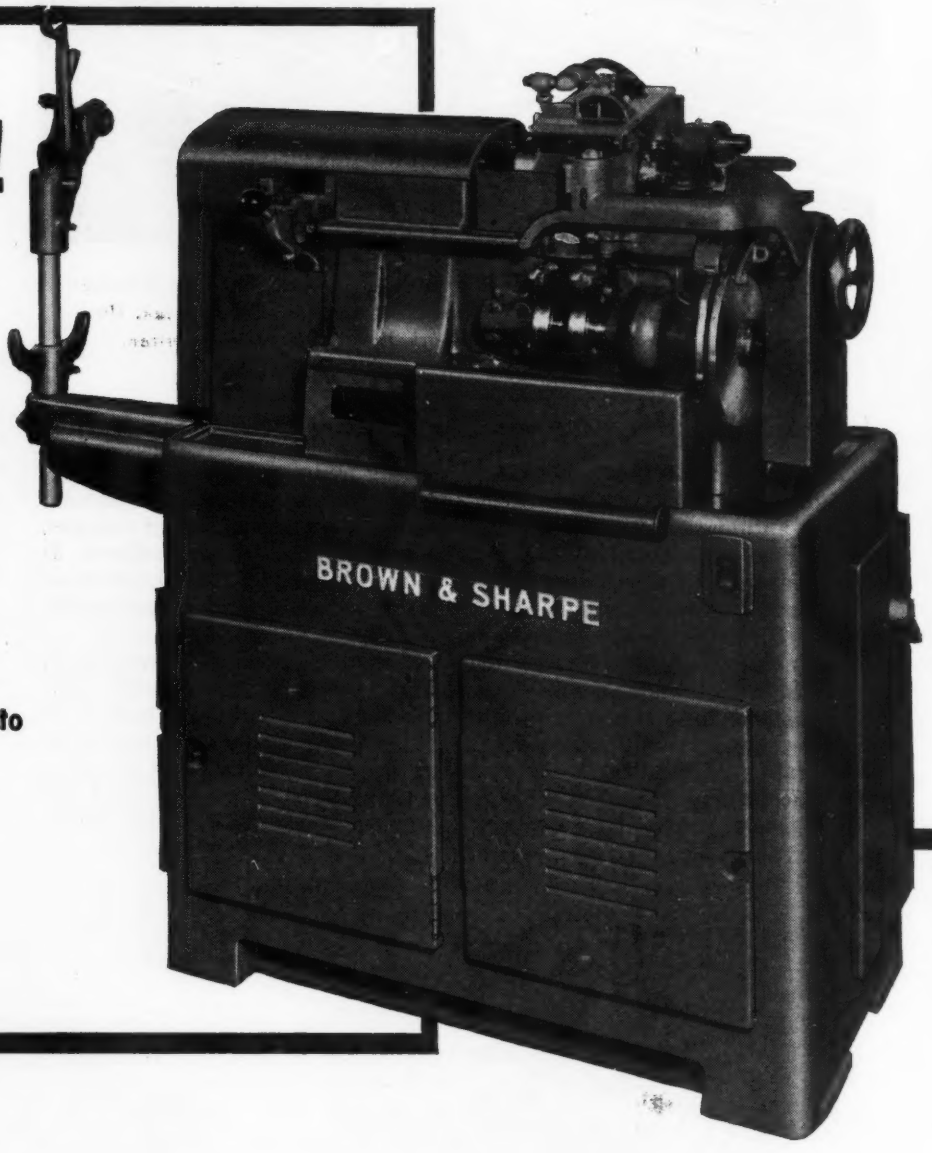
To obtain additional information on equipment described on this page, see lower part of page 206.

Here it is...

THE MOST ADVANCED DEVELOPMENT

UNIQUE! NEW!

AUTOMATIC PINION TURNING MACHINE



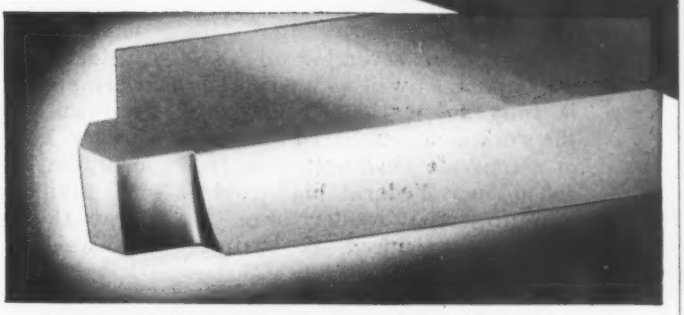
- Exclusive design
- 8-tool turret
- Circular-formed tool blades
- Positive micrometer tool stops
- Up to 4:1 ratio of cam lobe rise to longitudinal feed
- Single-point turning
- Turret axis parallel to work-axis
- Rigid work support

Now . . . with this new Brown & Sharpe Machine . . . consistent accuracy in staff and pinion turning is made practically automatic. Uniformly rapid automatic movements, regardless of time required to make a part, are insured by a constant speed drive shaft. Change gears provide rates of production from 3 to 364 seconds for one piece per cycle. 16 spindle speeds, from 10,000 to 910 r.p.m. Takes stock to ¼" diameter and turns up to 2⅞" length.

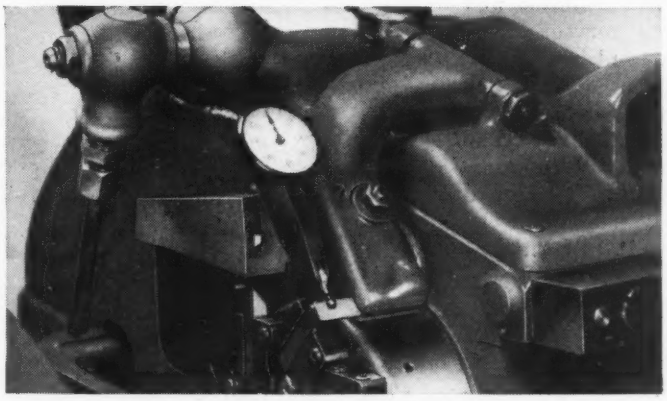
BROWN &

IN MACHINES FOR PINION and STAFF WORK

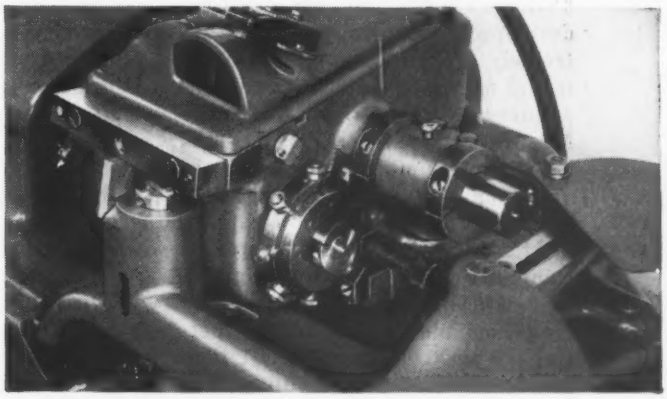
New Brown & Sharpe Automatic Pinion Turning Machine introduces new simplicity of set-up duplication . . . new, consistent accuracy of operation.



CIRCULAR-FORMED SINGLE-POINT TOOLS, an exclusive Brown & Sharpe development, retain exact original shape after resharpening by full-length surface grinding.



TOOL ADJUSTING DIAL INDICATOR on swing-arm permits accurate replacing of tool. Dial reading of original tool setting is duplicated simply when new tool is inserted.



INDIVIDUAL MICROMETER STOPS for each tool speed up original set-up and simplify accurate duplication when tools are replaced or reground.

A typical indication of the overall advances in design of the new Brown & Sharpe Automatic Pinion Turning Machine is the fact that *accurate operation can be maintained without highly skilled operators!* Accurate duplication of set-ups is made easier than ever before, by improved design . . . exclusive circular-formed single-point tools . . . built-in tool resetting indicator and centering gage . . . and individual micrometer stops for each of the 8 tool positions.

Another typical indication of the advanced design of this machine is its elimination of inherent mechanical sources of inaccuracy. Only 2 cams are employed in the drive mechanism . . . both mounted close together on the same drive shaft to eliminate torque distortion. And as much as 4:1 ratio of cam lobe rise to longitudinal feed further increases accuracy.

These are only a few of many features that contribute to the extraordinary efficiency of the new Brown & Sharpe Pinion Turning Machine for pinion and staff jobs. Write for complete information. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

SHARPE B·S

two cylinders through a system of toggle links.

An integral hydraulic pumping unit supplies the necessary oil pressure for operating the thirty-two double-acting welding guns, which are equipped with water-cooled point holders and welding points. Indexing of the fixture, operating of the welding guns, welding, and reversing of these operations, as well as unclamping, is fully automatic. Clamping of the work is accomplished by means of a separate push-button control.

The new Federal high-production projection welder (Fig. 2), recently announced, is equipped for the volume-operation welding of retaining strips and other sub-assemblies to the steel stampings forming the main body assembly of typewriters. With only one semi-skilled operator, the machine produces approximately 200 completed assemblies per hour.

The dies of this welder, which have special alloy inserts to coincide with the projections on the work-pieces, are designed to insure an ample flow of water for proper cooling. Two small air-operated hold-down clamps act as an auxiliary clamping unit and locate the parts in position during the welding sequence. 78

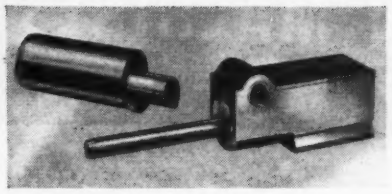


Fig. 2. Internal Comparator Attachment for Use with External Comparator Shown in Fig. 1

Brown & Sharpe Electronic Measuring Equipment

Electronic measuring equipment having unusual design features developed to facilitate making extremely accurate internal and external measurements has been announced by the Brown & Sharpe Mfg. Co., Providence 1, R. I. This new equipment consists of an amplifier unit, shown at the left in Fig. 1 mounted on a signal-light attachment, and an external comparator, shown at the right. Accurate linear graduations and simplified means for making settings from 0.0001 to 0.00001 inch are features of the amplifier unit.

The external comparator has a range of 0 to 4 inches. The setting of this instrument is simple and requires only one master. The anvil is reversible, and in addition to its regular gaging surface, has a narrow surface for small parts or work of irregular shape. The measuring pressure is adjustable, and the instrument can be checked at any time without gage-blocks or other masters. It is furnished with a diamond gaging point.

The internal comparator attachment, shown in Fig. 2, is used with the external comparator, being inserted in the latter unit in place of the anvil, which can be readily removed. By means of interchangeable plugs, measurements can be made over a range of 1/2 inch to 2 inches. Only one master is required in making the setting, and the mechanism has no pivots or other friction members to wear out.

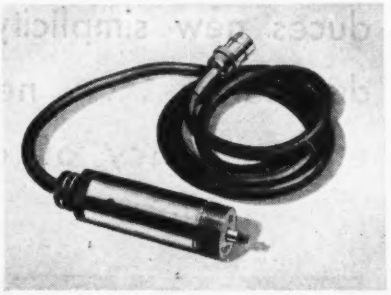


Fig. 3. Gage-head Cartridge for Use with Brown & Sharpe Electronic Amplifier

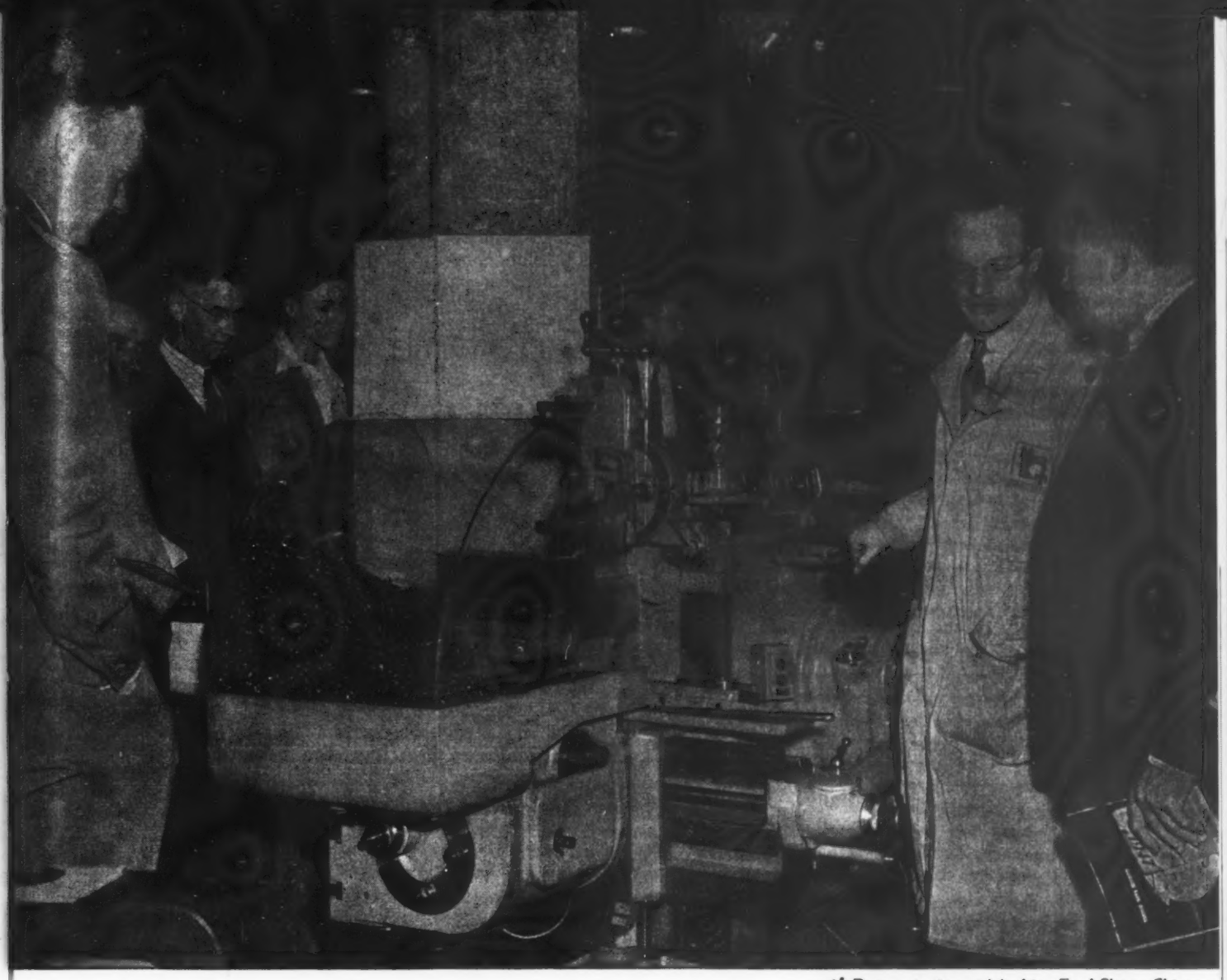
The gage-head cartridge, illustrated in Fig. 3, also a part of the new electronic measuring equipment, is frictionless, dust-proof and moistureproof. Its small, compact form makes it adapted for for a wide variety of installations on jigs, fixtures, gages, and inspection devices.

Where it is desired to utilize colored signal lights as a means of identifying quickly and without confusion the size of the piece being tested, a signal-light attachment unit can be supplied, as shown in Fig. 1. When used together, the signal-light attachment and the amplifier become, for all practical purposes, an integral unit.

The signal attachment has three glow type lamps. For external measurements, the red light indicates when the work-piece is too small, the blue light when the piece is too large, and the amber light when it is within the required tolerance. For internal measurements, the reverse condition obtains, the red light indicating when the piece is too large and the blue light when it is too small...79

Fig. 1. Brown & Sharpe Electronic Measuring Equipment Consisting of External Comparator, Amplifier Unit, and Signal-light Attachment

To obtain additional information on equipment described on this page, see lower part of page 206.



*Demonstration at Machine Tool Show, Chicago.

CARBIDES PAY ... with the CINCINNATI TOOL LIFTER ...on CINCINNATI SHAPERS

The rigidity that dampens vibration; the power for the toughest steels; the speed for thrifty carbide performance—all are found in Cincinnati Heavy Duty Shapers.

Whether it's alloy steels, chilled castings, chipper blades, or glass molds—carbides on Cincinnati Heavy Duty Shapers are cutting manufacturing costs.

*This Cincinnati Shaper, equipped with a Cincinnati Tool Lifter and carbide tools, operated steadily at 200 strokes a minute at the Machine Tool Show in Chicago. During this ten-day demonstration the shaper was producing a superior finish—quickly and efficiently—on Heppenstall grade B die blocks.

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO U.S.A.

SHAPERS · SHEARS · BRAKES

Eclipse Bench Type Furnace

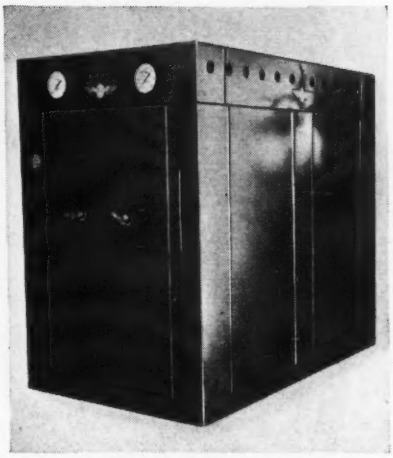
Eclipse Improved Bench Type Furnace

A completely redesigned and improved small oven furnace for tool shops which do not require elaborate or expensive heat-treating equipment has been brought out by the Eclipse Fuel Engineering Co., 778 S. Main St., Rockford, Ill. This furnace is especially suitable for intermittent use in hardening punches, dies, and small tools or for brazing applications where space is limited.

The new furnace is designed primarily for use where low-pressure air is available. The combustion equipment includes a burner and a proportional mixer which provides single valve temperature control ranging from 1400 to 1600 degrees F. 80

Colonial Broaching Machines

The Colonial Broach Co., Box 37, Harper Station, Detroit 13, Mich., has brought out two new lines of broaching machines. The machine shown in Fig. 1 is representative of the line of pull-down machines, while that shown in Fig. 2 is one of the new line of pull-up machines. Both of these lines are available in 5- and 10-ton models. Improved controls, easier maintenance, and increased production are advantages claimed for these broaching machines.....81



"Hi-Lo" Pressure Power Pack for Actuating Large Size Presses

Greer Power Pack

The latest addition to the line of hydraulic Power Packs made by Greer Hydraulics, Inc., 454 Eighteenth St., Brooklyn 15, N. Y., is a "Hi-Lo" pressure unit designed for actuating presses of huge size. The unit illustrated was built for the Norton Co. to

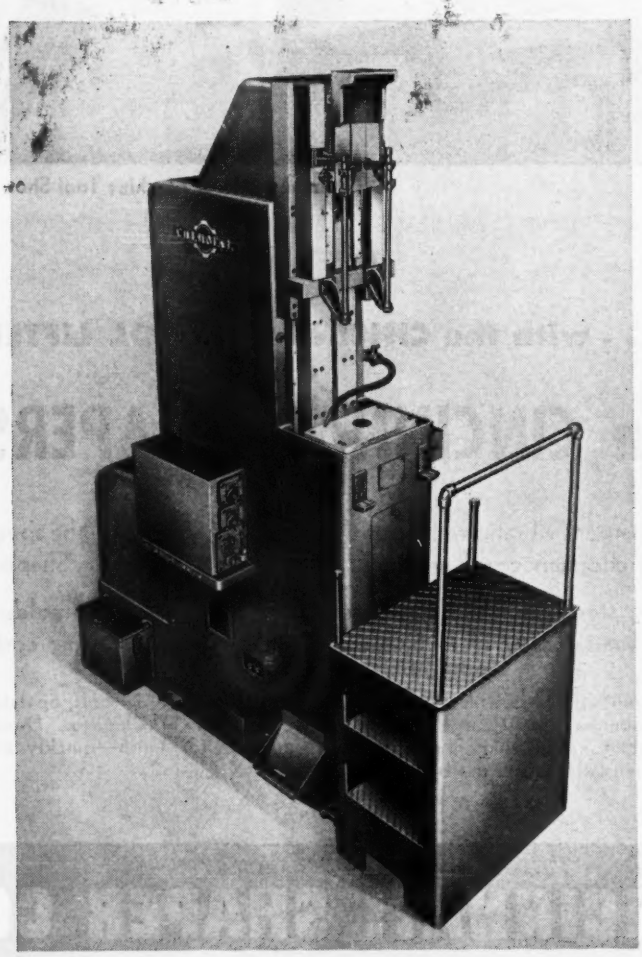


Fig. 1. Colonial Pull-down Type Broaching Machine

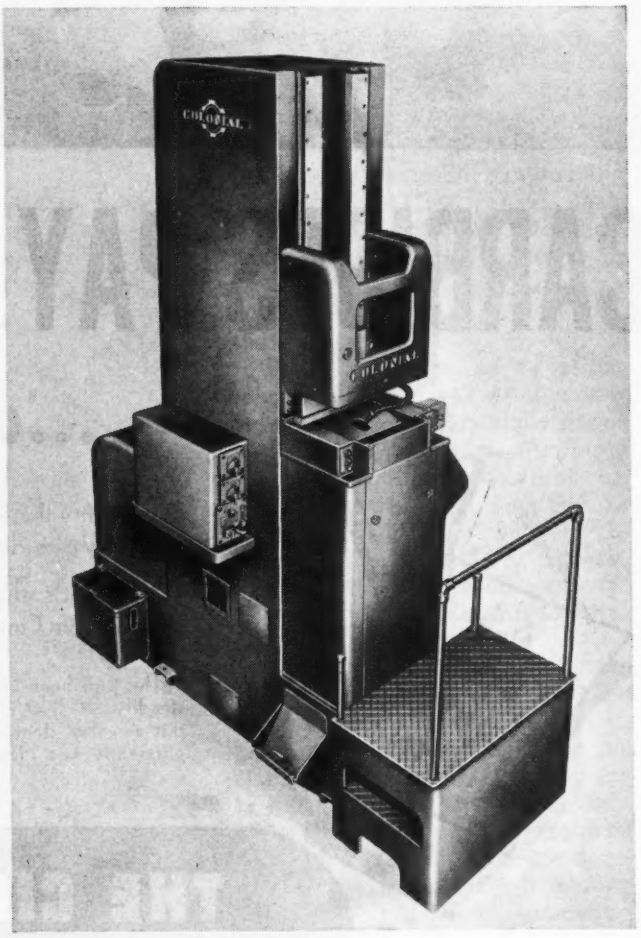
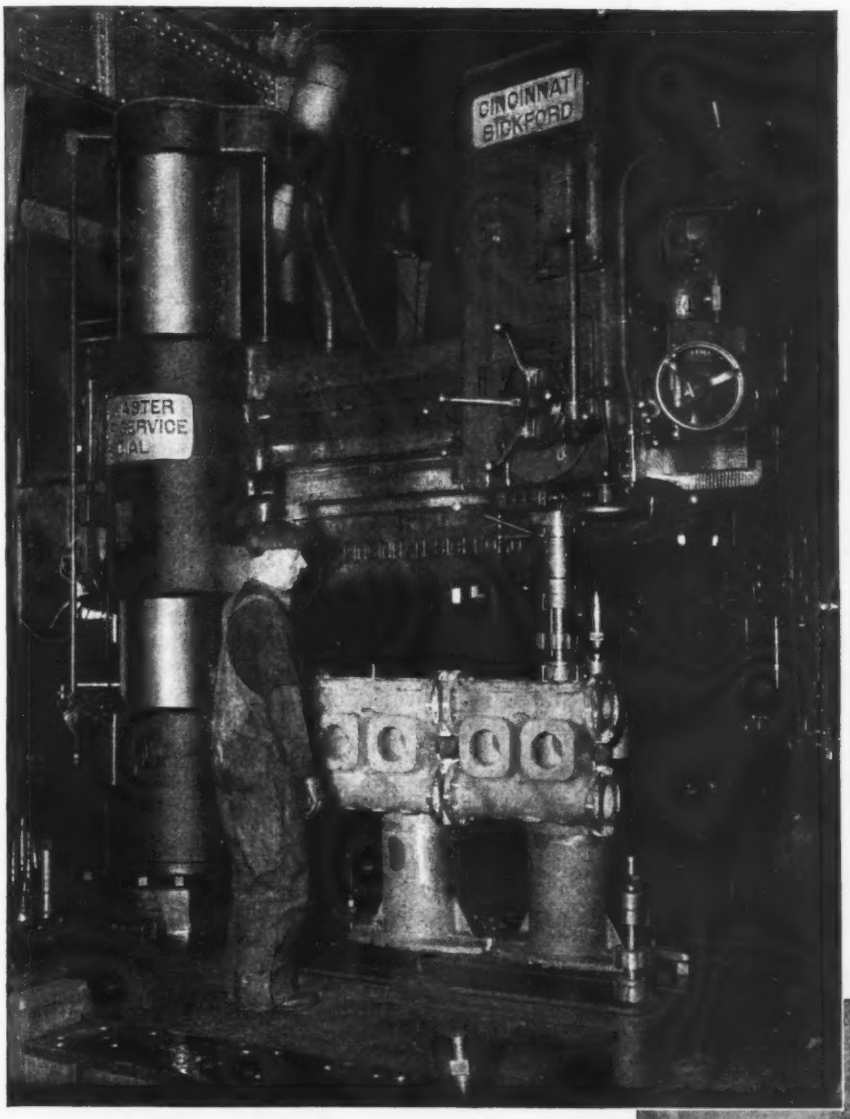


Fig. 2. Colonial Pull-up Type of Broaching Machine

To obtain additional information on equipment described on this page, see lower part of page 206.

THE master OF THE JOB ...



For the really big job, Cincinnati Bickford Master Super Service Radial Drills—the largest and most powerful radial drills built—give outstanding service.

Forty horse power, constant speed driving motor—spindle speeds from 12 to 1200 r.p.m., or from 6 to 600 r.p.m., insure efficient drilling or boring of holes from ¼" to 16" in diameter.

Very large, heavy castings are handled on these Master Super Service Drills—with their 7' to 12' arm and their 22" to 26" diameter columns. The operator controls these massive Radial Drills with ease—all operating levers being centralized low on the head.

o

If your job requires unusual power, rigidity and capacity in the machine, write for Circular R-22 on the Cincinnati Master Super Service Radial Drills—the masters of the job.

RADIAL AND UPRIGHT SUPER SERVICE DRILLING MACHINES

Equal Efficiency of Every Unit Makes the Balanced Machine

THE CINCINNATI BICKFORD TOOL CO. Cincinnati 9, Ohio U.S.A.

meet specific requirements, one operation, for example, calling for a flow of 124 gallons per minute at a pressure of 2000 pounds per square inch. Normally this would require an electric motor having an output of 145 H.P. and a correspondingly large-volume, high-pressure pump. By incorporating five 10-gallon accumulators in the circuit, it is possible to reduce the size of the motor to 30 H.P., with a correspondingly large saving in the cost of installation and upkeep.

The unit consists of an all-steel cabinet, housing all the circuit components. The hydraulic circuit is powered by a dual-shaft, 30-H.P. electric motor, one end of the motor-shaft driving a low-pressure pump and the other end a high-pressure pump. 82

Johnson Inclinable Power Press

The Johnson Machine & Press Corporation, Elkhart, Ind., is building a new inclinable power press of 90-ton capacity, which can be used in the horizontal position or tilted back at an angle of 25 degrees to permit the work to drop away from the press without requiring an ejector. This press will handle work up to 15 inches in depth at a production rate of forty-four pieces per minute. It has an extra thick bolster plate, designed to provide additional strength for heavy operations without reducing the available die space. An interchangeable thin steel bolster can be furnished which allows a larger die space for a press of this size.

A patented tripping device is provided to protect the operator in case of spring breakage. If one of the two springs should break, the other spring will actuate the trip, and if both springs break, the clutch will be automatically disengaged. The springs can be easily replaced in thirty seconds without stopping the machine. A friction type brake is located within easy reach of the operator and can be quickly and easily adjusted by means of a knob.

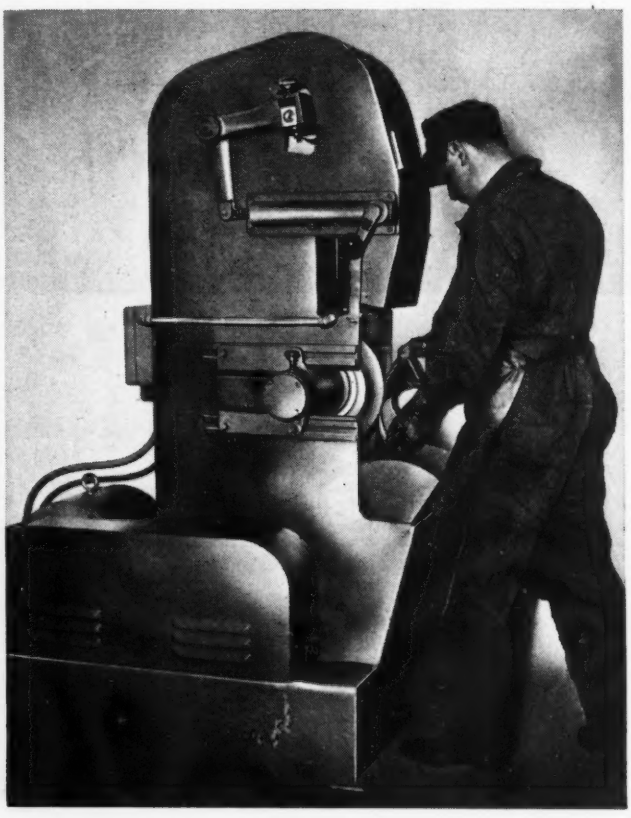
The standard stroke length is 4 inches, but a special stroke length of 9 inches is available at extra cost. The top of the bolster is 28 inches front to back, and 40 1/2 inches right to left. The bolster is 4 inches thick, and the maximum distance from its top surface to the slide, with the ram at the bottom of its stroke, is 17 inches. The throat depth from the center of the ram to the frame is 15 inches, and the distance from the bed to the slide is 21 inches. The press has a back-shaft speed of 250 R.P.M., and is equipped with a 7 1/2-H.P. motor operating at a speed of 1800 R.P.M. It weighs about 17,000 pounds.....83

Porter-Cable Belt Grinder Designed for Contour Work

A new abrasive belt grinder designed for grinding and polishing contour work has been brought out by the Porter-Cable Machine Co., 1801-7 N. Salina St., Syracuse 8, N. Y. The flexed abrasive belt of this machine approaches and leaves a formed contact roll at a slight angle, draping itself about the pattern on the roll, and thus grinding and polishing the work to the required shape.

The contact roll is made of sisal and latex, and is said to hold its

Inclinable Power Press Built by the Johnson Machine and Press Corporation



Porter-Cable Abrasive Belt Contour Grinding and Polishing Machine

To obtain additional information on equipment described on this page, see lower part of page 206.

Specify EX-CELL-O Grinding Spindles

When you specify EX-CELL-O Grinding Spindles—for new equipment or as replacement—you get a spindle definitely designed and manufactured for *precision* work, one that will keep your grinder operating smoothly and at top efficiency. . . . For a quarter of a century EX-CELL-O spindles have been the favorite of numerous grinder and other machine tool builders. . . . If you want to get the utmost in grinder performance, be sure to specify EX-CELL-O Grinding Spindles—with *sealed-in lubrication!*

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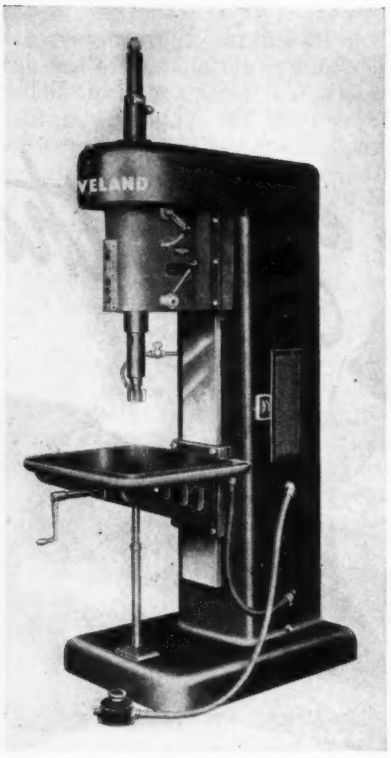
MANUFACTURERS OF PRECISION MACHINE TOOLS • CONTINENTAL CUTTING TOOLS • MISCELLANEOUS PRODUCTION PARTS
FUEL INJECTION EQUIPMENT • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • DAIRY EQUIPMENT

pattern indefinitely and yet provide the slight resiliency required for smooth, fast grinding. Grinding and polishing with flat-face contact rolls ranging from hard rolls to soft buffs can be easily accomplished on this grinder. It requires a space only 26 by 38 inches and employs a 148-inch abrasive belt. Its contact roll does no driving, but serves as an idler, thus avoiding heating and the transmission of motor and shaft vibration. The surface speed of the abrasive belt remains constant, regardless of the diameter of the contact roll. 84

Johnson Metal-Cutting Band Saw

A wet type horizontal metal-cutting band saw with a capacity for cutting work 10 by 18 inches has been brought out by the Johnson Mfg. Corporation, Room 624, Chrysler Bldg., New York 17, N. Y. This machine has been designed to handle certain types of production and high-speed cutting work more efficiently than the dry type band saw previously introduced by the company.

The new machine is said to give maximum cutting efficiency, and at the same time retains the simplicity of operation afforded by the dry type machine. The coolant system is a complete unit designed for continuous operation. The coolant pump starts and stops automatically, and is easily disconnected to permit dry cutting if desired. 85



One of Six New Precision Tapping Machines Built by the Cleveland Tapping Machine Co.

Cleveland Tapping Machines

A line of six high-speed precision tapping machines employing hardened and ground lead-screws which operate in long, full-diameter bronze lead-screw nuts is now being built by the Cleveland Tapping Machine Co., Hartville, Ohio. In addition to single-hole tapping, these machines can be used with multiple heads for tapping groups of holes at each stroke of the spindle.

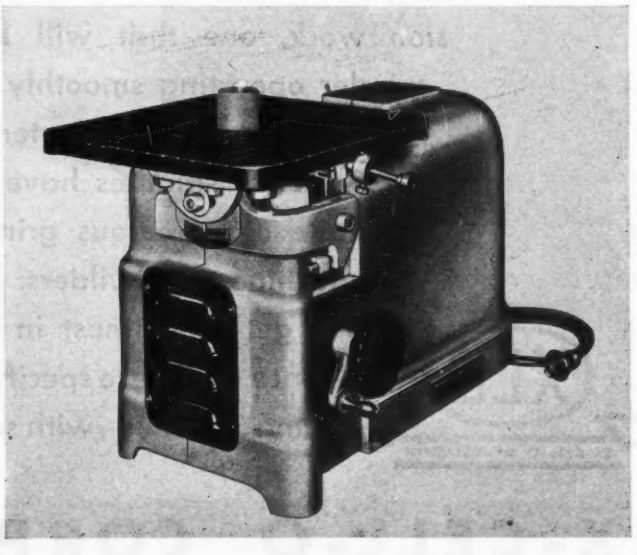
With this equipment, it is possible to tap holes of different sizes. Adjustable heads can be used where the pattern of holes varies and different feed devices can be combined with automatic cycling of the machine to provide completely automatic operation.

The six machines in this line have capacities for tapping holes from 1/4 inch to 2 3/4 inches in mild steel. The machines have from three to eight spindle speeds; the model shown in the illustration, for example, has eight spindle speeds and a capacity for tapping 3/8-inch to 1 7/8-inch National Coarse threads in mild steel.

Outstanding features of these machines include a new super-sensitive clutch designed to eliminate tap breakage, and a precision depth control for safe blind-hole tapping. Air-operated indexing fixtures, shuttle fixtures, and other devices can be furnished to suit production requirements. 86

Milwaukee Profile Grinder

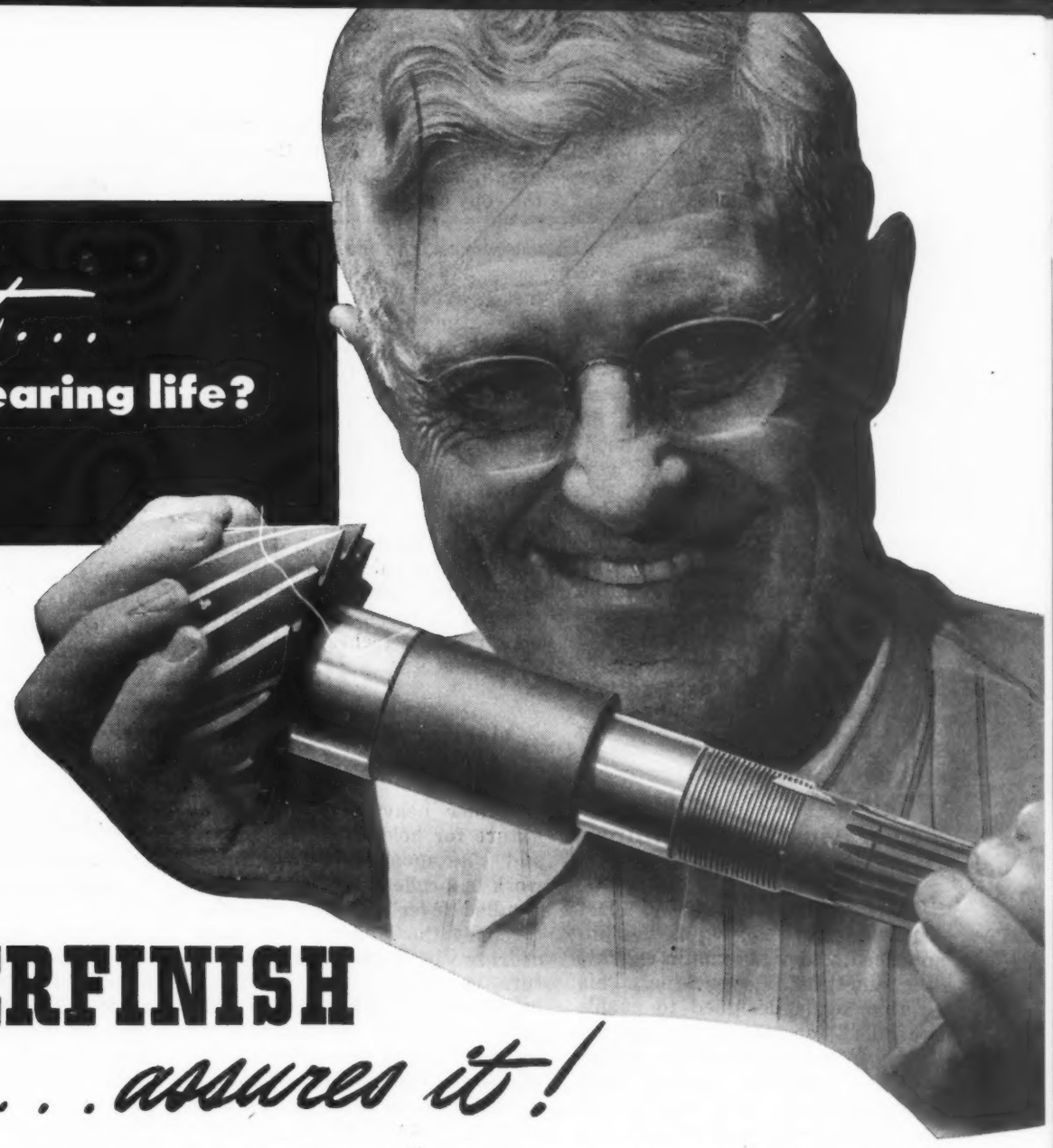
The Milwaukee Chaplet & Mfg. Co., 1023 S. 40th St., Milwaukee, Wis., has recently placed on the market a new bench type, high-speed profile grinder having a number of features that are said to provide operating advantages in the tool-room and machine shop or on production grinding operations. Designed specifically for



(Above) Milwaukee Bench Type Profile Grinder

(Left) Johnson Band Saw Equipped for Wet Cutting

To obtain additional information on equipment described on this page, see lower part of page 206.



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● Yes, you can double—triple—quadruple—the life of bearings with simple, precautionary measures which take only a few minutes.

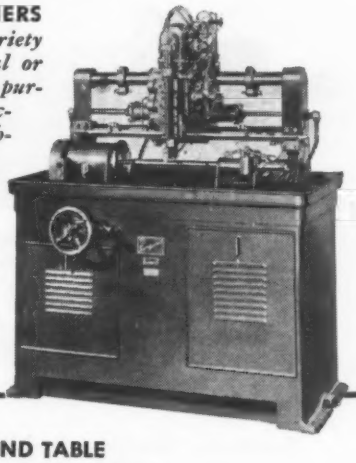
Examine a finely ground surface. No matter how smooth it may appear, it has defects in the form of grinder scratches, chatter and feed marks, and "smear metal" softened by the heat of grinding wheels. When these tiny metal ridges rub together, they rupture the protective oil film to cause scoring, excessive wear and increased clearances.

Superfinishing removes these defects—produces a bearing surface that is virtually frictionless. And its life is almost unlimited.

Superfinishing is a much quicker and more economical process than you may think. And it pays for itself many times over in better service and lower replacement cost.

Ask your nearest Gisholt Representative for the facts about Superfinishing.

GISHOLT SUPERFINISHERS *are available in a variety of types for cylindrical or flat surfaces; for general purpose or continuous production work; also as attachments for use on lathes. Write for literature.*



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represents the collective experience of specialists in the machining, surface finishing and balancing of round or partly round parts. Your problems are welcomed here.

the precision grinding of interior and exterior profiles, curved, and irregular surfaces, it permits a high degree of accuracy in the finishing of hardened steel parts for tools, dies, jigs, and fixtures.

The work-table can be tilted 15 degrees in any direction, the angle being indicated by a graduated dial and pointer. It has a 3 1/4-inch vertical adjustment, actuated by a crank-handle. A built-in diamond dresser is instantly available for use in keeping the wheels in fast, true cutting condition.

A high-speed motor drives the vertical spindle at 20,000 R.P.M., and has ample power for the full range of grinding wheels from 1/8 inch to 1 1/2 inches in diameter. The spindle reciprocates 1/8 inch vertically 100 times per minute, resulting in free-cutting, even-wearing wheels and high cutting efficiency. 87

Airdraulics Automatic Engraving and Profiling Machine

Airdraulics, Inc., 100 W. 101st St., New York 25, N. Y., has announced a new automatic engraving and profiling machine. This equipment is designed to enable unskilled operators to quickly learn to reproduce molds and to engrave templets, jewelry, and other products. It is adapted for engraving work on practically any type of material.

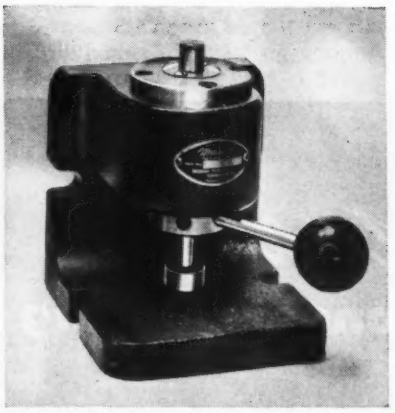
Besides profiling or engraving in a 1 to 1 ratio, the pantograph movement permits engraving work to be done at any desired reduction. Operation requires only the placing of lettering, templets, or drawings on one side and tracing these with the arm of the pantograph, which, upon moving over the copy causes the engraving dial to duplicate the form or profile on the work. The machine is driven by a 110-volt universal electric motor, which operates on either alternating or direct current.

The adjustable vise of the unit will hold work up to 5 by 8 inches, and the machine will engrave areas up to 4 by 4 inches. A micrometer depth adjustment permits taking deep or shallow hair-line cuts, as required. Convex or concave surfaces can be engraved from a flat master copy, maintaining uniform thickness of the engraved line. The profiling machine is 21 by 21 inches, has an over-all height of 14 inches, and weighs 42 pounds. 88

Merrion Collet Chuck Fixture

A new heavy-duty angle type fixture for holding round, square, and hexagon second-operation work in a collet operated by a ball-handled lever is being manufactured by the Merrion Tool Engineering Co., Berwyn, Ill. This fixture is about 5 1/2 by 5 1/2 by 6 inches, and has a work-holding collet with a capacity for handling round pieces 5/8 inch in diameter. It can be used for drilling, threading, reaming, countersinking, counterboring, straddle-milling, slotting, cutting off, hollow-milling, assembling, and various other operations.

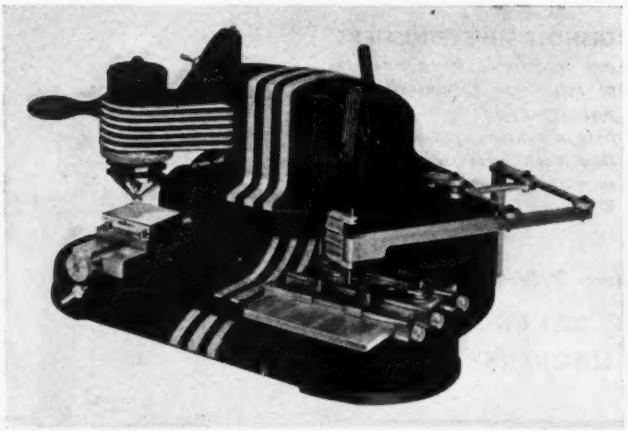
The collet is protected from chips by a cover, which is supplied for all sizes from 1/8 to 5/8 inch. Cross-drilling and end-milling attachments are also available. An adjustable, self-cleaning stop is furnished, which can be removed to permit handling long pieces through the stop collar. The fixture is made of semi-steel, normalized, and all working surfaces are hardened and ground. 89



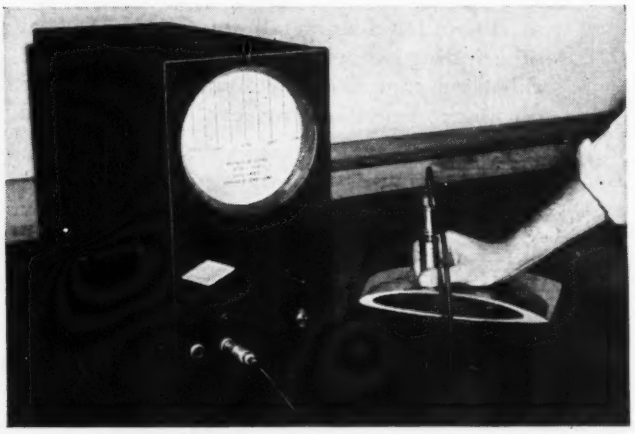
Merrion Collet Chuck

"Reflectogage" Thickness Measurement and Flaw Detection Instrument

A new instrument utilizing supersonics for thickness measurements and flaw detection, known as the "Reflectogage," has been brought out by Sperry Products, Inc., 15th St., and Willow Ave., Hoboken, N. J., to supplement the "Supersonic Reflectoscope" and the "Thruray" instruments made by the company. With the new "Reflectogage," the thickness of metals and other materials can be measured where access to only one side of the part to be measured is possible. The maximum error in making measurements with the



Automatic Engraving and Profiling Machine Announced by Airdraulics, Inc.



"Reflectogage" for Measuring Thickness of Materials when Only One Side is Accessible

To obtain additional information on equipment described on this page, see lower part of page 206.

REEVES Sales & Service Representatives—from Coast to Coast!

California
Western Gear Works, Lynwood
Pacific Gear & Tool Works, San Francisco 3

Colorado
R. F. Hamilton & Associates, Denver 2

Florida
H. C. Flanagan, Tampa 1

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Reeves Pulley Co., Atlanta

Illinois
Reeves Pulley Co., Chicago 6

Indiana
A. R. Young, Indianapolis 4

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Alfred Halliday, Louisville 2

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F. N. Johnston, Inc., New Orleans 12

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Carey Mchy. & Supply Co., Baltimore 2

Massachusetts
Reeves Pulley Co., Cambridge 42

Michigan
Reeves Pulley Co., Detroit 11

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R. X. Raymond Co., Minneapolis 3

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New York
Reeves Pulley Co. of N. Y., Inc., New York 7
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Potter & Dugan, Inc., Rochester 4
Potter & Dugan, Inc., Syracuse 2

North Carolina
M. R. Snyder Co., Charlotte 2

Ohio
Reeves Pulley Co., Cleveland 3
John T. Young, Cincinnati 23

Oklahoma
Ward R. McGavren Co., Oklahoma City 7

Oregon
C. W. Harshberger, Portland 4

Pennsylvania
Reeves Pulley Co., Philadelphia 4
W. G. Kerr Co., Pittsburgh 22

Rhode Island
Machine Parts Corp., Providence

South Carolina
J. W. Vaughan Co., Greenville

Tennessee
Riechman-Crosby Co., Memphis 1

Texas
Geo. J. Fix Co., Dallas 1
Brance-Krachy Co., Inc., Houston 1

Utah
James Q. Leavitt Co., Ogden

Virginia
Asa A. Tuttle, Norfolk 1
Smith-Courtney Co., Richmond 11

Washington
Western Gear Works, Seattle 4

West Virginia
E. W. Smith, St. Albans

Wisconsin
Parsons-Caro Co., Milwaukee 2

CANADA

Ontario
Peerless Engineering Sales, Ltd., Toronto 4

REEVES is also represented by speed control specialists in 18 foreign countries.

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In more than 260,000 widely diversified industrial installations covering some 25,000 plants—and as standard equipment on more than 2,100 different makes of machines—REEVES Speed Control is providing the infinite, accurate speed adjustability which assures increased output, improved, uniform quality and lower manufacturing costs.

Sharing the credit for this enviable record—along with the men who design and build REEVES Variable Speed Drives—is a third group of men. These are the men whose reponsibility it is to see that every REEVES application is correctly engineered, installed and serviced—REEVES Speed Control Engineers.

Realizing that its obligation to users of REEVES-equipped machines does not end with the closing of the sale, but continues throughout the operating lifetime of the equipment, REEVES today maintains a nation-wide organization of these *specialists in the specialized field of speed control engineering.* Check the list at the left for the name of the REEVES representative nearest you. Feel free to consult him, without obligation, on any speed control problem relating to the machines you build or operate. He's a valuable man to know because he knows his business.

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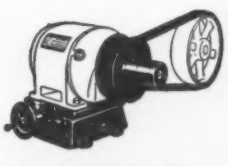
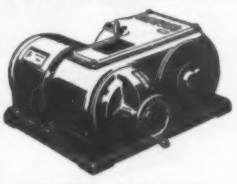
THE THREE BASIC REEVES SPEED CONTROL UNITS

VARIABLE SPEED TRANSMISSION for providing infinite, accurate speed flexibility over a wide range—2:1 to 16:1. Sizes—fractional to 87 hp.



VARI-SPEED MOTOR PULLEY provides an instantly variable speed drive within 4:1 ratio for any constant speed motor. Sizes to 15 hp.



MOTODRIVE combines motor, speed varying mechanism and reduction gears in single compact unit. Speed variations 2:1 to 6:1 inclusive. Sizes to 15 hp.

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REEVES Speed Control

Gives the Right Speed for Every Job!

Fig. 1. Bradford "Kool Grip" Portable Disk Sander

Fig. 2. "Metalmaster" Palm Drill

"Reflectogage" is less than 2 per cent of the thickness of the material.

The thickness of tubing and flat parts between 0.005 and 0.300 inch can be read directly from the face of the oscilloscope screen. The thickness of parts up to 4 inches can be determined from the readings by making a simple calculation. A different screen is used for each type of material and for each of four thickness ranges.

The new gage is readily adaptable for the production line testing of thin pieces or bonded or clad materials for internal defects or separations. 90

"Metalmaster" Disk Sanders and Palm Drill

Recent additions to the line of "Metalmaster" portable tools manufactured by the Bradford Machine Tool Co., Cincinnati, Ohio, include "Kool Grip" portable disk sanders and polishers and a 1/4-inch palm drill. The sanders and polishers, one of which is shown in Fig. 1, have a new type of cooling system for the motor and tool grip. An air intake through the rear handle (for which a patent is pending) provides a large volume of clean, cool air to the motor and directs the exhaust air away from the operator. This drill is made in three models, a 7-inch heavy-duty sander, a 9-inch standard-duty sander, and a 7-inch polisher. A universal 110-volt motor is standard equipment, but a 220-volt motor is also available.

The new compact, powerful 1/4-inch "Metalmaster" palm drill, shown in Fig. 2, has been designed with a hand-fitted pistol grip, in which a special trigger switch for intermittent use is incorporated. This tool is furnished with a three-jaw Jacobs chuck. The new drill has a capacity for drilling 1/4-inch holes in steel and 1/2-inch holes in hard wood. The 110-volt AC-DC motor drives the drill at a speed of 1100 R.P.M. with full load and 1900 R.P.M. with no load. Motors for other voltages can be supplied. 91

Orlandi Gear-Checker Equipped for Checking Helix Angles

Rapid checking of the helix angle of helical-tooth gears can be accomplished on the new Orlandi gear-checker announced by the Michigan Tool Co., 7171 E. McNichols Road, Detroit 12, Mich. A visual check of the helix angle is obtained by the use of a simple adjustable head, which enables the operator to check the gears as rapidly as they can be lifted from the resting plate and locating pin and replaced by a new gear. By the use of this equipment, it is

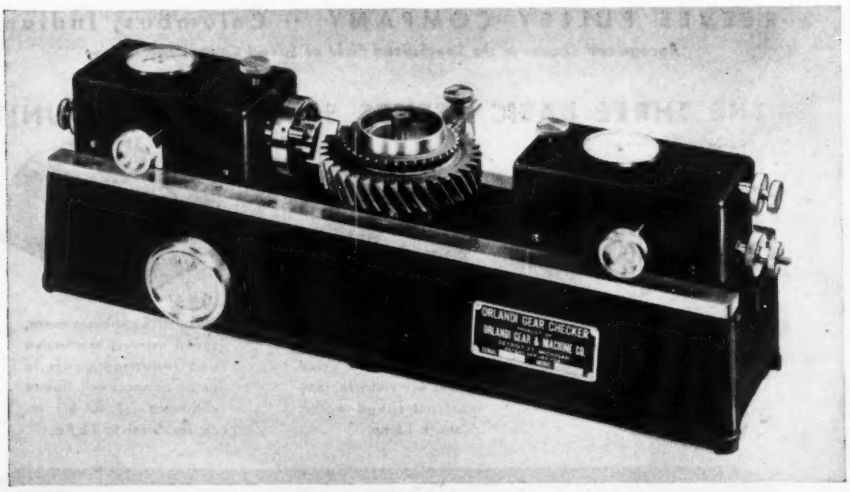

Fig. 1. (Left) Orlandi Gear-checker Equipped for Checking the Helix Angle of Gear Shown in the Testing Position. Fig. 2. (Right) Setting up the Helix Angle Adapter of the Orlandi Gear-checker by the Use of Gage-blocks

To obtain additional information on equipment described on this page, see lower part of page 206.

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Practically universal acceptance of carbide tooling marked the 1947 Machine Tool Show.

The machines are ready! The tools are available! The know-how is yours for the asking! **NOW** is the time to put carbides to work **throughout** your plant—to help you keep pace with other leading plants* of the nation in the battle for competitive markets.

—and in applying carbides, our entire organization is at your service to help you obtain maximum effectiveness at minimum cost. Let our engineers show you how over 600 low-cost standard Carboloy tools and blanks can be applied to 60%-80% of your machining applications. Write for Catalog GT 200 just off the press. CARBOLOY COMPANY, INC., 11147 E. 8 Mile Rd., Detroit 32, Michigan.

*In a recent survey by a leading metal working magazine, one out of every five plants stated carbides would be used for 70% or more of their new machine tooling. One out of every two indicated 50% or greater carbide usage.

and Turn to **CARBOLOY** CEMENTED ® CARBIDES *for Lowest-cost Carbide Tooling*

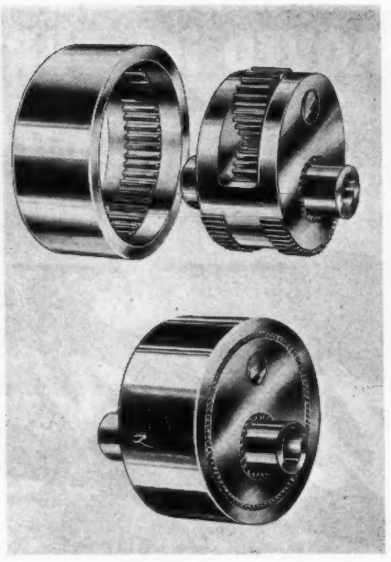
possible to check several hundred pieces per hour.

Checking of the pitch diameter, concentricity, size, tooth space, backlash, and parallelism of spur, helical, and worm gears, as well as the three-wire checking of thread forms, can also be performed on this machine accurately and at high speed, even by inexperienced operators. 92

Epicyclic Gear Reduction Drive

A simple and efficient means of converting high rotating speeds into slow reciprocating motion is made available by an epicyclic drive unit for which manufacturing license arrangements can be obtained from the American Brake Shoe Co. through R. B. Parker, 230 Park Ave., New York 17, N. Y. This device can be built on anti-friction or plain bearings, depending on power requirements. Test data on the device, when applied to compressors and hydraulic pumps, is said to have shown greater efficiency than with more conventional methods of belt or gear driving.

The design of the drive permits considerable flexibility of both speed and stroke, making possible the use of built-in or direct-drive input power where desirable in streamline or packaged products. Multiple units of different gear ratios and strokes can be mounted on a common power shaft. One geared epicyclic unit used in conjunction with a master connecting-rod lends itself to radial design in either vertical or horizontal positions. 93



Gear Reduction Drive Developed by the American Brake Shoe Co.

Precision Tool-Room Inspection Equipment

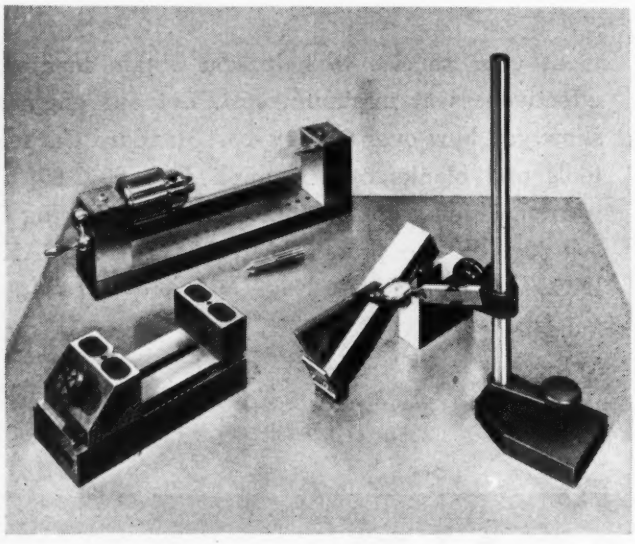
A line of tool-room inspection equipment consisting of a "Whirlijig" and centers having a base 12 inches long, equipped with a Jacobs chuck; De Luxe vises in capacities from 0 to 4 inches; a 5-inch sine bar 1 1/8 inches wide with end plate; set of size-blocks; and "Edwalt" test-gage has been placed on the market by Joseph B. Fakes & Co., 1415 Etowah Ave., Royal Oak, Mich. 94

Ames Hardness Tester

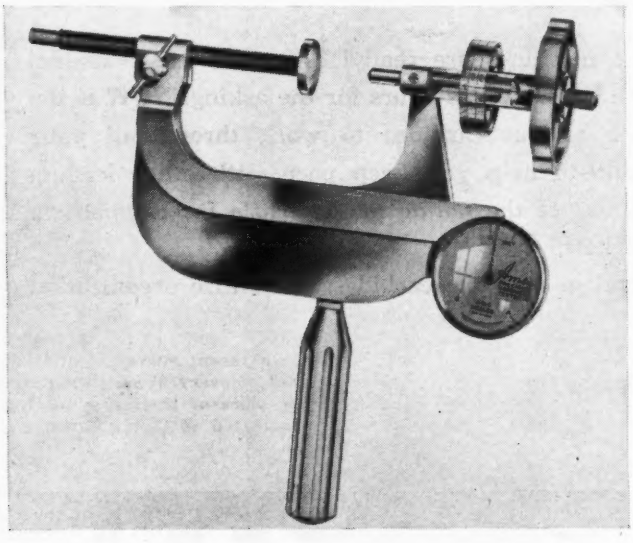
A portable hardness tester weighing slightly over 3 pounds, which has a capacity for testing pieces up to 4 inches thick and reads directly in Rockwell hardness scales, has been brought out by the Ames Precision Machine Works, Waltham 54, Mass. This Model 4 instrument is designed to meet the needs for a tester of larger capacity than the 1-inch size made by the company. Round and flat material (hard and soft) from very thin strips up to a thickness of 4 inches can be tested quickly and accurately with the new model.

The frame is shaped like that of an ordinary 4-inch micrometer, and is sprung slightly when pressures are applied to the penetrators by turning the handwheel. A diamond penetrator is used for testing hardened steel, and ball penetrators for soft materials, as specified in the Rockwell chart. A lever extends across the front of the frame which actuates the dial indicator when pressures are applied and released.

The indicator dial has graduation lines which show when pressures of 60, 100, and 150 kilograms are applied by turning the handwheel. Correct Rockwell readings are taken from the graduated barrel dial which is located beneath a Lucite magnifier for easy reading. The hardened anvil is threaded into the frame. Test blocks, penetrators, anvils, and a Rockwell conversion chart are supplied with the tester. 95



Tool-room Inspection Equipment Brought out by Joseph B. Fakes & Co.



Portable Precision Hardness Tester Made by Ames Precision Machine Works

To obtain additional information on equipment described on this page, see lower part of page 206.

Have You Considered

what this tool can do for YOU?

● Quickwork stamping trimmers trim, form, and bead complicated stampings in a matter of seconds—and do it accurately. Eliminating the need for expensive trimming dies and saving valuable press time, they cut production costs and speed output as well.

Handling almost any type of stamping in a single plane, Quickwork trimmers trim steel, stainless steel, and aluminum alloy stampings, with or without flash, with equal ease. Fixtures are especially adapted to the job, guiding even the most intricate stampings throughout the entire pass.

Check the possibilities of a Quickwork for solving your stamping trimming problems; write for Bulletin QW-119.

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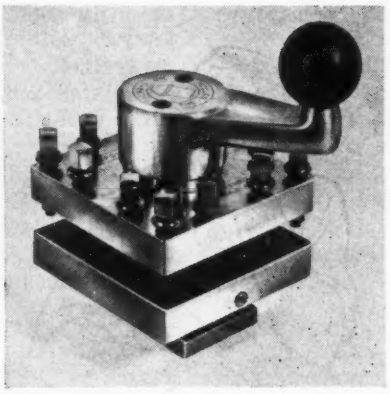


Self-indexing Turret Tool-holder Made by Beekman Engineering Co.

Beekman Self-Indexing Turret Tool-Holder

A self-indexing turret tool-holder developed during the war to meet the demand for a faster, more accurate device that could be quickly attached to any lathe to convert it into a production machine for such operations as turning, boring, threading, facing, and cutting off is being manufactured by the Beekman Engineering Co., 1927 S. W. First Ave., Fort Lauderdale, Fla. This tool-holder, formerly built only on special order, is known as the "Tripoint Turret." It consists of three main parts—a body or tool-block, base or turntable, and operating handle.

The supporting and indexing mechanisms of this tool-block (on which patents are pending) are simple and effective. They consist of twelve equally spaced conical depressions on the lower side of the tool-block and three accurately spaced hardened conical locating buttons in the base. The three buttons engage three of the conical depressions, locating the tool-block in its proper position and giving it a three-point bearing.

The self-indexing mechanism (for which patents are also pending) is of simple, positive design. The turret is released, indexed, and reclamped, by a half-turn of the handle, the whole operation requiring less than a second.

The operating handle can be adjusted to any of eight positions. The tool-holder is so designed that it is impossible for chips or other foreign matter to enter the mechanism. The tool slots are 5/8 by 1/2 inch, and the tool-block is 3 1/2 inches square. The tool weighs 6 3/4 pounds. 96

Crystal Lake Precision Bench Lathe

A new precision bench lathe having a collet capacity of 1 inch, a center distance of 19 inches, and a swing of 13 inches has been brought out by Crystal Lake Grinders, Crystal Lake, Ill. This lathe is equipped with a cam-lock type spindle nose, and is available in a choice of three spindle bearings—a Zero Timken 4.3307-inch outside diameter bearing; a New Departure Ultra-super No. 9 preloaded ball bearing for higher than normal spindle speeds, of 4.3307 inches outside diameter, with two bearings in front and one bearing at the rear; and a Crystal Lake double-taper spindle, Ketos tool-steel hardened and ground bearing having a diameter of 3 inches, and a 3 1/2-inch flange. The double-taper bearings are designed for drilling alloy steels where fast feeds and high finishes are required.

The lathe is equipped with a large compound slide rest having a travel of 4 1/2 inches. The 3/4-inch lead-screw runs in oil pockets.

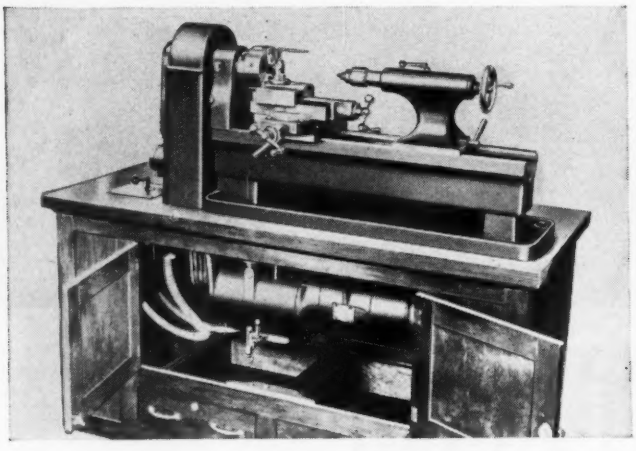
An aluminum belt cover is provided which can be readily moved to permit rotating the 8-inch multiple V-belt pulley of the lathe by hand for lapping or truing work in the four-jaw chuck. A 1 1/2-H.P. motor is required for the drive. 97

Quick-Change Toolpost for Engine Lathes

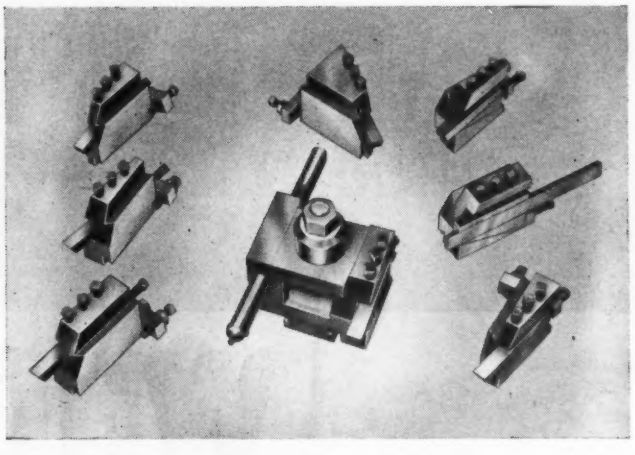
A toolpost for engine lathes which permits an unlimited number of machining operations to be performed without changing the work set-up is a recent development of the A. K. Tool Co., 2029 Blake Ave., Los Angeles 26, Calif. Changing tools for different operations is said to be accomplished with this toolpost in about the same time required for indexing a turret toolpost. The new toolpost is suitable for use on both production and non-production lathe work. It is extremely rigid and is adaptable for use with carbide tool bits.

Minimum tool overhang, fast simple tool height adjustment, and a stop which can be adjusted independently of the tools are features incorporated in this holder. The latter feature makes it possible to turn various diameters from one dial setting. One or more tools can be replaced after grinding without affecting the setting of the other tools.

This toolpost is available in sizes to fit lathes of from 9 to 24 inches swing and to take tool bits from 1/4 to 1 1/4 inches. 98



Precision Bench Lathe Brought out by Crystal Lake Grinders



Quick-change Lathe Toolpost Developed by the A. K. Tool Co.

To obtain additional information on equipment described on this page, see lower part of page 206.

Another New Britain Automatic with

initial and permanent accuracy

A NEW LINE OF PRECISION CONTOUR TURNING AND BORING MACHINES

Accurate and Fast — Cam and Air Actuated

Featuring **1.** An endless variety of contours or combinations may be generated with a single point tool Besides all the regular jobs of straight precision boring and turning, facing and chamfering, it will produce lands, recesses, flanges, steps, counterbores, and radii

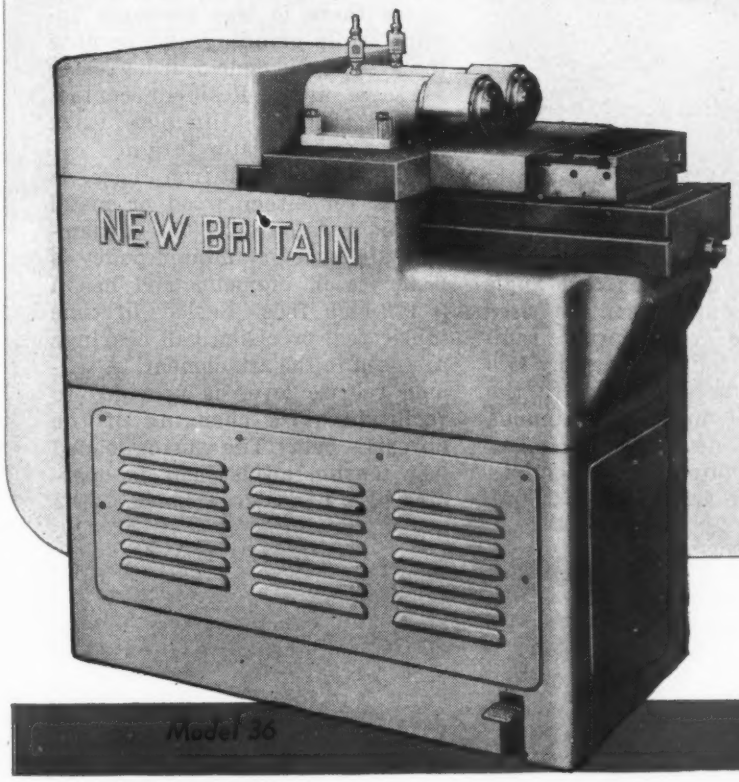
2. A disc type cam for each table gives positive action consistently throughout the day — from the first to the last piece — uninfluenced by temperature changes

3. Through positive cam action, tool approaches on rapid traverse to within 005 of the work and immediately starts to feed Tool may cut on feed-in or drawback stroke, or both for rough and finish cuts. On return stroke, tool jumps clear eliminating drag off marks When moving between intermittent or successive cuts, tool goes into rapid traverse

4. Uniform temperature, anti-friction bearings, and super precision spindles provide spindle speeds up to 7,500 RPM. Mechanical precision chucking operated by air cylinders. Neither chucking nor unchucking operation affects preload or position of spindle bearings.

5. Only one dimension need be inspected on any one set-up, regardless of the number of diameters produced by any one single-point tool. Cams control and positively repeat from piece to piece.

6. Set-up of machine depends entirely upon nature of job. Work may be rotated in spindles or mounted on table, loaded from the front of the spindle or through the spindle. Spindles may be raised, lowered, or separated. Two spindles are standard, but more may be added. Changing job set-up simply requires replacing two cams, setting tool for size and changing chucks.



THREE OTHER NEW MACHINES

Latest additions to the New Britain line include: The new, faster, more powerful line of automatic screw machines designed to make the most of carbides on long and short runs, the Model 365, tool rotating, double end chucking machine — and the new line of automatic turret lathes.

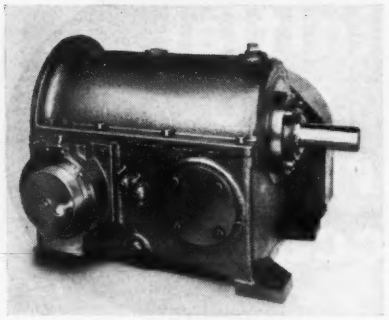
THE NEW BRITAIN MACHINE CO. NB

NEW BRITAIN

Automatics

THE NEW BRITAIN MACHINE COMPANY
NEW BRITAIN-GRIDLEY MACHINE DIVISION
NEW BRITAIN, CONNECTICUT

M-01064



Lombard Variable-speed Reducer

Lombard Variable-Speed Reducer

A compact variable-speed reducer designed for installations where the ratio of maximum to minimum output speeds is large has been brought out by the Lombard Governor Corporation, Ashland, Mass. With a constant-speed motor, the reducer provides an output speed which is continuously adjustable through a 20 to 1 ratio. It is available in sizes from 2 to 15 H.P. With an input motor speed of approximately 1800 R.P.M., the maximum output speed is usually about 175 or 220 R.P.M., depending upon the size of the unit. The minimum speed ranges down to slightly above zero. Remote control by a speed control motor can be furnished.. 99

"Whit-Aloy" Aluminum-Body Chuck

The Whiton Machine Co., 508 Howard St., New London, Conn., has developed an aluminum-body chuck made from special analysis aluminum known as "Whit-Aloy." This alloy is claimed to have the strength of steel, the wearing qualities of cast iron, and the lightness of aluminum.

The new chuck can be easily handled and permits quick changing. Its light weight also permits quick starting and stopping and eliminates drag. The models of this chuck now being produced are made for direct mounting on Type D-1 American Standard nose spindles. The chuck jaws, scroll, and pinions are made of heat-treated alloy steel. 100

Matco Grinding Wheel Dresser

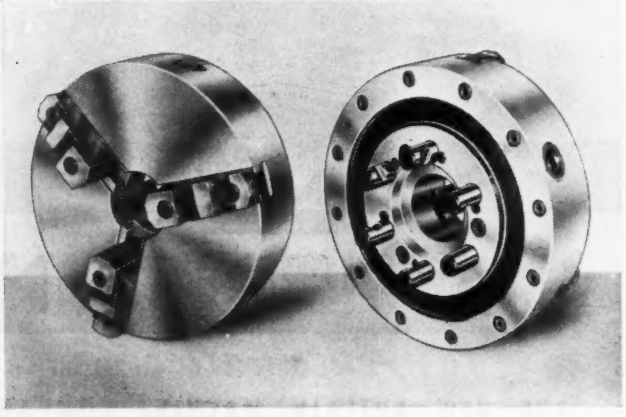
Radius Wheel-Dresser

The Matco Tool Co., 2834 W. Lake St., Chicago 12, Ill., has brought out a radius and angle wheel-dresser that can be used for concave or convex radii forming and for dressing any two angular surfaces tangent to the formed radii in one continuous motion. The new micro diamond adjuster permits the diamond to be set to an accuracy of 0.0001 inch. Micrometer feed is provided for precision dressing. A special tip-back column arrangement eliminates the necessity for removing the dresser from the machine table. The dresser can be obtained with a sub-base for T-slot machines if desired.....101

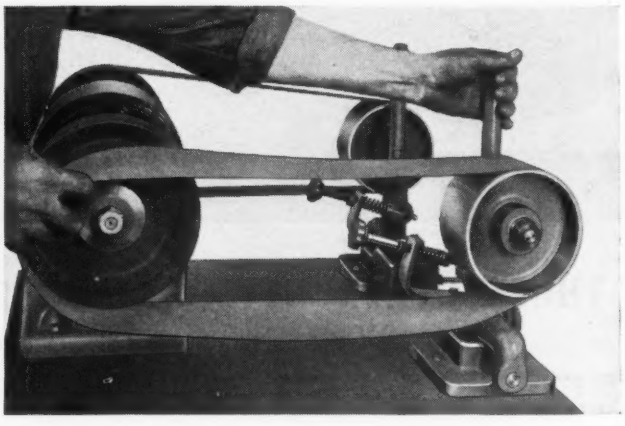
Hammond Bench Backstand for Abrasive Belt Grinding

A new bench backstand designed to convert wheel type bench grinders into high-production abrasive belt units adapted for faster grinding, deburring, and finishing operations has been announced by Hammond Machinery Builders, Inc., 1619 Douglas Ave., Kalamazoo 54, Mich. With this equipment, the grinding wear is on the abrasive belt and not on the supporting contact wheel. For this reason, the contact wheel remains true, with square corners, and maintains its diameter and balance. The abrasive belt cuts cooler because there is less pressure applied while grinding and because the grinding is done over a greater abrasive area. Resilient contact wheels serve to eliminate work chatter and operator fatigue.

The heavy cast-iron base is drilled for either wood or metal bench installation. The dynamically balanced aluminum pulley is 6 inches in diameter and has a 3 1/2-inch face. Sealed, lifetime lubricated, precision ball bearings are used in the attachment. A tension release lever is provided to facilitate quick changing of the abrasive belt. The spring-loaded belt tension adjustment is operated by a hand-screw knob.....102

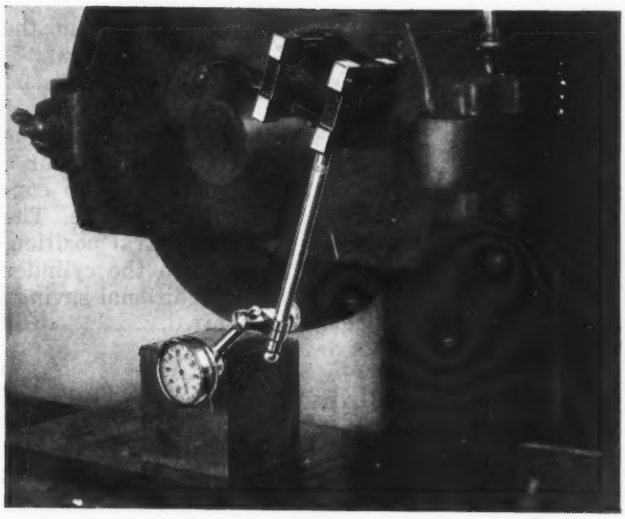


"Whit-Aloy" Aluminum-body Chuck Placed on the Market by the Whiton Machine Co.

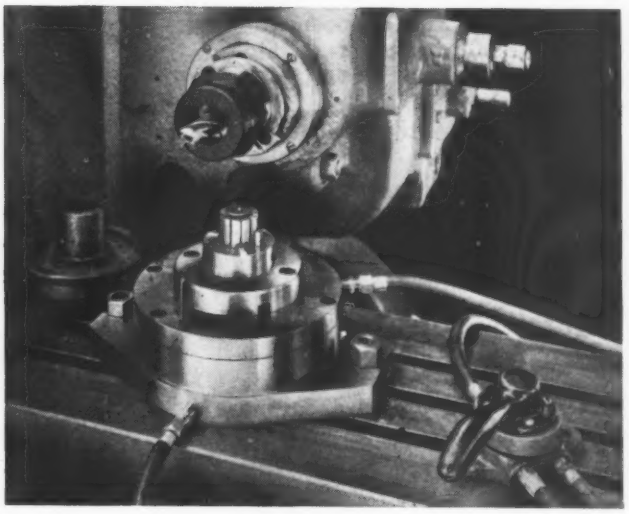


Bench Grinder Converted to Abrasive-belt Unit by Adding Hammond Backstand Attachment

To obtain additional information on equipment described on this page, see lower part of page 206.



Lewis Magnetic Base Attached to Flat Surface of Grinder Shield



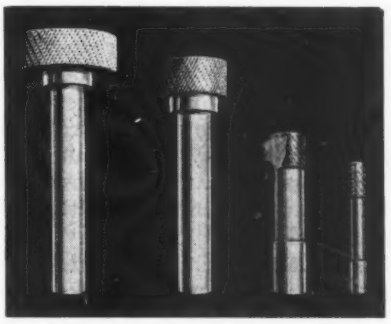
Erickson Chuck Equipped with Special Air-operated Work-holding Fixture

Lewis Magnetic Base for Holding Dial Gages

A magnetic base, 2 by 2 by 2 1/8 inches, having a grip of 40 to 50 pounds, which is equally effective on all four sides has been brought out by the Lewis Machine Co., Inc., 1160 E. Seventh St., St. Paul 6, Minn., to provide a convenient means for instantly mounting a dial indicator or height gage on a machine tool in any desired position. This permanent-magnet base can also be used for many other purposes, including holding work on surface plates, supplying magnetism to rods used for the removal of chips from drilled holes, and even as a chuck for holding light work. The base is furnished with 7/32- and 5/16-inch interchangeable brass indicator mounting posts. 103

Ford Carbide Grinding Burrs

A new carbide grinding burr developed for internal grinding, jig grinding, and blending or fine finishing by off-hand grinding has been announced by the M. A. Ford Mfg. Co., Inc., 780 W. First St., Davenport, Iowa. This tool is said to operate equally well on soft materials and on steels having a hardness of 65 Rockwell C. The burrs are precision-ground on special machines. Greatly improved performance, faster material removal, ability to hold their shape without dressing or set-up adjustments, finer finish, and no loading of the cutting surface are advantages claimed for these burrs. The burrs are stocked in standard sizes from 1/16 to 3/4 inch tool diameter for



Ford Internal Grinding Burrs

operation in precision grinding equipment at conventional grinding speeds. 104

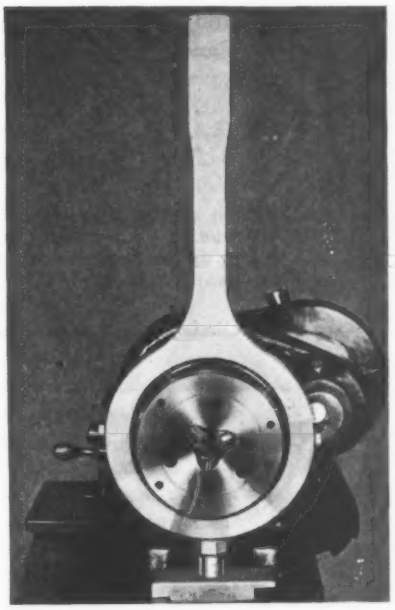
Special Air-Operated Work-Holding Fixture for Erickson Chucks

A special air-operated work-holding fixture incorporating an Erickson precision faceplate mandrel is a new product of Erickson Tools Division, 2309 Hamilton Ave., Cleveland 14, Ohio. This fixture is fitted with special locators for positioning the work so that it is held square and concentric with respect to the spindle.

The work is located at a constant height and always in the exact position desired in relation to the reference point on the piece. The air-operating feature permits mounting and removal of the work with a minimum effort. Interchangeable sleeves and provision for accommodating three additional sizes of mandrels increase the range of work that can be handled. 105

Fry Multi-Duty Speed Chuck

Airo Products Co., 2938 Denby Ave., Los Angeles 26, Calif., has announced a new model Fry multi-duty speed chuck which is designed to combine the advantages of both the collet and the jaw chuck. It can be quickly adjusted to take concentric or eccentric work, and has a positive tool-steel jaw-position lock.



Fry Multi-duty Chuck Announced by Airo Products Co.

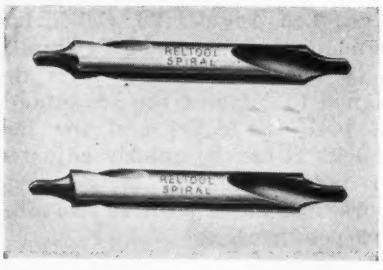
To obtain additional information on equipment described on this page, see lower part of page 206.

The chuck can be opened or closed while in motion at high speed and when operating in either direction. It has a capacity for holding 1/8- to 1-inch round, 7/8-inch hexagon and 3/4-inch square stock. The new chuck is adaptable to either engine or turret lathes. 106

Spiral Center Drill and Countersink

A spiral center drill and countersink has recently been introduced by the Reltool Corporation, Milwaukee, Wis., which is said to prolong the life of such tools and to lengthen the time between tool grinding operations. This tool was developed especially for use in the motor industry. It has a 22-degree spiral angle, which results in a shearing action that produces a smooth hole. A large open flute provides for chip clearance.

The spiral tool also has the Reltool "shockless" feature, consisting of a fillet at the point where the 60-degree countersink angle meets the tip. 107



Reltool Spiral Center Drill and Countersink

Knox Four-way Air Valve

"Air-Miser" Four-Way Air Valve

Knox Industries, Inc., 5548 N. Main St., Lexington, Mich., is producing a new four-way air valve known as the "Air-Miser." This valve is designed with a by-pass port in the bronze disk which allows half of the compressed air used for the power stroke of a double-acting air cylinder to be employed for the return stroke of the piston. The air thus utilized is exhausted into the atmosphere when conventional type valves are employed.

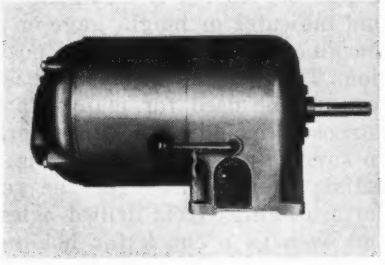
The valve simply by-passes the air used on the power stroke of a cylinder to the opposite end of the cylinder through an accumulator, which stores 50 per cent of the exhausted air and uses this air to return the piston to the starting position. This utilization of exhausted air is said to reduce the load volume consumed from the air compressor by 50 per cent.

The valve has an auxiliary port that can be used should more air be needed for the return of the piston. This gives the operator a conventional four-way valve control plus the by-pass feature. The valve also has a neutral position, which is used when the cylinder is idle to effect additional savings in compressed air. 108

Lima Gear-Shift Drive

The Lima Electric Motor Co., 1801 Findlay Road, Lima, Ohio, has just announced a four-speed gear-shift drive with integrally mounted single-phase motor. This new unit is built to drive machinery requiring selective speeds, and is available in ratings of 1/2 H.P. at 1200 R.P.M. and 3/4 H.P. at 1800 R.P.M. Gear ratios obtainable are 1 to 1, 1.33 to 1, 2 to 1, and 4 to 1.

The units will operate on 115- and 230-volt, 50- and 60-cycle alternating current. Mechanically the single-phase and polyphase units are identical 109



Gear-shift Drive Brought out by Lima Electric Motor Co.

To Obtain Additional Information on Shop Equipment

Which of the new or improved equipment described in this section is likely to prove advantageous in your shop? To obtain additional information or catalogues about such equipment, fill in below the identifying number found at the end of each description—or write directly to the manufacturer, mentioning machine as described in November, 1947, MACHINERY.

No.	No.	No.	No.	No.	No.	No.	No.	No.	No.

Fill in your name and address on blank below. Detach and mail within three months of the date of this issue to MACHINERY, 148 Lafayette Street, New York 13, N. Y.

NAME.....POSITION OR TITLE.....

[This service is for those in charge of shop and engineering work in manufacturing plants.]

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New Trade Literature

RECENT PUBLICATIONS ON MACHINE SHOP EQUIPMENT, UNIT PARTS, AND MATERIALS

To Obtain Copies, Fill in on Form at Bottom of Page 210 the Identifying Number at End of Descriptive Paragraph, or Write Directly to Manufacturer, Mentioning Catalogue Described in the November, 1947, Number of MACHINERY

Automatic Screw Machines

GREENLEE BROS. AND CO., 1866 Mason Ave., Rockford, Ill. Bulletin A-401, describing a new threading attachment for Greenlee four-and six-spindle automatic screw machines which enables precision threading to be done at production speeds, and which can be quickly interchanged with conventional equipment. Copies can be obtained if requested on a company letter-head addressed to Greenlee Bros. & Co.

Chip-Breaker Chart

WENDT-SONIS CO., Hannibal, Mo. Illustrated chart containing detailed information on the preparation of four types of chip-breakers on carbide-tipped tools for different classes of machining cuts. Copies can be obtained without charge by writing the company.

Milling, Broaching, and Grinding Machines

CINCINNATI MILLING AND GRINDING MACHINES, INC., Cincinnati 9, Ohio. Condensed booklet prepared for distribution at the Machine Tool Show, illustrating the company's complete line of products, including seventeen machines of new design and two special machines. The machines shown include milling, die-sinking, broaching, cutter-sharpening, grinding, and lapping machines...1

Broaching Machines and Tools

AMERICAN BROACH AND MACHINE CO., Ann Arbor, Mich. Circular 300, descriptive of the company's single-ram, single dual, and duplex hydraulic surface broaching machines. Circular 202, illustrating and describing the American Type V-1 two-ton press for arbor press work, straightening, assembling, and push-broaching operations. 2

Feed-Regulating Device

EDSON ENGINEERING CO., 219 Main St., Boonton, N. J. Catalogue describing "Copilot" feed regulators for hand-fed drill presses and other machines, which enable the maximum safe feeding rate of the tool to be predetermined and operation limited to that rate, in order to prevent breaking drills and cutters or damaging the work. 3

Tool and High-Speed Steels

ALLEGHENY LUDLUM STEEL CORPORATION, 2020 Oliver Bldg., Pittsburgh 22, Pa. Catalogue listing the tool and high-speed steel warehouse stocks of the company, indicating types, shapes, and sizes available, as well as the exact location of each item in stock, so that the buyer can determine the nearest source of supply.....4

Polishing and Buffing Wheels

HANSON-VAN WINKLE-MUNNING CO., Matawan, N. J. Bulletin SS-100, describing a combined buffing and polishing wheel for preparing steel surfaces for nickel and chromium plating. Bulletin descriptive of wheels made of various materials for polishing all types of metals. 5

Wear-Resistant Metal

METAL CARBIDES CORPORATION, Youngstown 5, Ohio. Catalogue 47-WM, containing specifications, including prices, on Talide Metal for wear-resistant applications. The catalogue lists over 1000 different sizes of tungsten-carbide blanks, bars, strips, rods, etc., carried in stock for immediate shipment. 6

Cylindrical Grinding Machines

LANDIS TOOL CO., Waynesboro, Pa. Booklet prepared for distribution at the recent Machine Tool Show, describing the inception of the organization and its growth to its present status. The latest models of precision grinders are illustrated, and condensed specifications are included. 7

Precision Finishing Machines and Internal Grinders

HEALD MACHINE CO., Worcester 6, Mass. Catalogues illustrating and describing various models of Bore-Matic precision finishing machines. Bulletin describing the outstanding features of the new Heald Models 271-371 automatic chuck type internal grinding machines. 8

High-Production Rotary Gear-Finisher

MICHIGAN TOOL CO., 7171 E. McNichols Road, Detroit 12, Mich. Bulletin 870A47, illustrating and describing the company's new automatic underpass rotary gear-finisher, which is adapted for three different methods of gear shaving — underpass, transverse, and "traverpass." 9

Carbide Tools

WILLEY'S CARBIDE TOOL CO., 1340 W. Vernor Highway, Detroit 1, Mich. Catalogue 30, describing

the characteristics of Willey's metal (tungsten carbide) and giving specifications covering standard tools and blanks, tipped tools, solid carbide drills, circular saws, bushings, dies, etc.....10

Automatic Machines

CLEVELAND AUTOMATIC MACHINE Co., 4936 Beech St., Cincinnati 12, Ohio. Circular announcing the new Cleveland 2 1/2-inch single-spindle Dialmatic, equipped with electric feed drive and designed for use either as a bar machine or a chucking machine. 11

Turret Lathes and Cutting-Off Machines

BARDONS & OLIVER, INC., 1133 W. Ninth St., Cleveland 13, Ohio. Catalogue showing typical examples of the company's line of ram and saddle type turret lathes, and Hydraelectric automatic, semi-automatic, and hand-operated cutting-off machines. 12

Fluid-Power Variable-Delivery Pump

OILGEAR Co., 1340 W. Bruce St., Milwaukee 4, Wis. Bulletin 44200, illustrating and describing this company's new fluid-power variable-delivery feed pump with electro-hydraulic control, applicable to machine tools and processing equipment. 13

Heat and Corrosion Resisting Alloys

DRIVER-HARRIS Co., Harrison, N. J. Catalogue R-46, containing 72 pages of data, including tables and charts, on high-nickel electrical heat and corrosion resisting alloys, of value to the designer, engineer, metallurgist, and manufacturer. 14

Electronic Measuring Equipment

BROWN & SHARPE MFG. Co., Providence 1, R. I. Catalogue descriptive of Brown & Sharpe electronic measuring equipment for making internal and external measurements in units varying from 0.0001 to 0.00001 inch.....15

Lead-Screw Tapping Machines

CLEVELAND TAPPING MACHINE Co., Hartville, Ohio. Catalogue illustrating and describing the new Cleveland Model E lead-screw tapping machine designed for high-speed precision production tapping. 16

Aluminum Temper Designation

ALUMINUM Co. OF AMERICA, 1748 Gulf Bldg., Pittsburgh 19, Pa. Bulletin describing the revised system of aluminum-alloy temper designations developed by the company for Alcoa cast and wrought products. 17

Broaches

ARROW BROACH Co., 9100 Roselawn Ave., Detroit 4, Mich. Sheet of standards, giving dimensions of the various broaches made by the company, as well as the cutter number for use in ordering.....18

Wrenches

BLACKHAWK MFG. Co., Milwaukee 1, Wis. Catalogue 247, covering the complete line of Blackhawk wrenches, of socket, open end, and box types. Bulletin 46-T, containing data on six models of torque indicator wrenches. 19

Ball-Bearing Transmission Units

FAFNIR BEARING Co., New Britain, Conn. Catalogue containing data on Fafnir "Mechani-Seal" ball-bearing transmission units, including single pillow blocks and flange cartridges, for light or normal loads. 20

Worm-Gear Speed Reducers

CLEVELAND WORM & GEAR Co., 3276 E. 80th St., Cleveland 4, Ohio. Catalogue entitled "Proof of the Pudding," describing several specific examples of savings obtained through the installation of "Speedaire" worm-gear speed reducers. 21

Carbide Internal Finishing Machine

ABRASIVE MACHINE TOOL Co., East Providence 14, R. I. Catalogue illustrating and describing the new Abrasive internal finishing machine designed for use on dies, bushings, etc., made from carbides or similar materials.....22

Hydraulic Pumps

HYDRO-POWER, INC., Belmont and Sheridan Aves., Springfield, Ohio. Bulletin 471, containing specifications covering the line of radial piston type hydraulic pumps made by this company for supplying pressures up to 3000 pounds per square inch. 23

To Obtain Copies of New Trade Literature

listed in this section (without charge or obligation), fill in below the publications wanted, using the identifying number at the end of each descriptive paragraph; detach and mail within three months of the date of this issue (November, 1947) to MACHINERY, 148 Lafayette Street, New York 13, N. Y.

No.	No.	No.	No.	No.	No.	No.	No.	No.	No.

NAME.....POSITION OR TITLE.....

[This service is for those in charge of shop and engineering work in manufacturing plants.]

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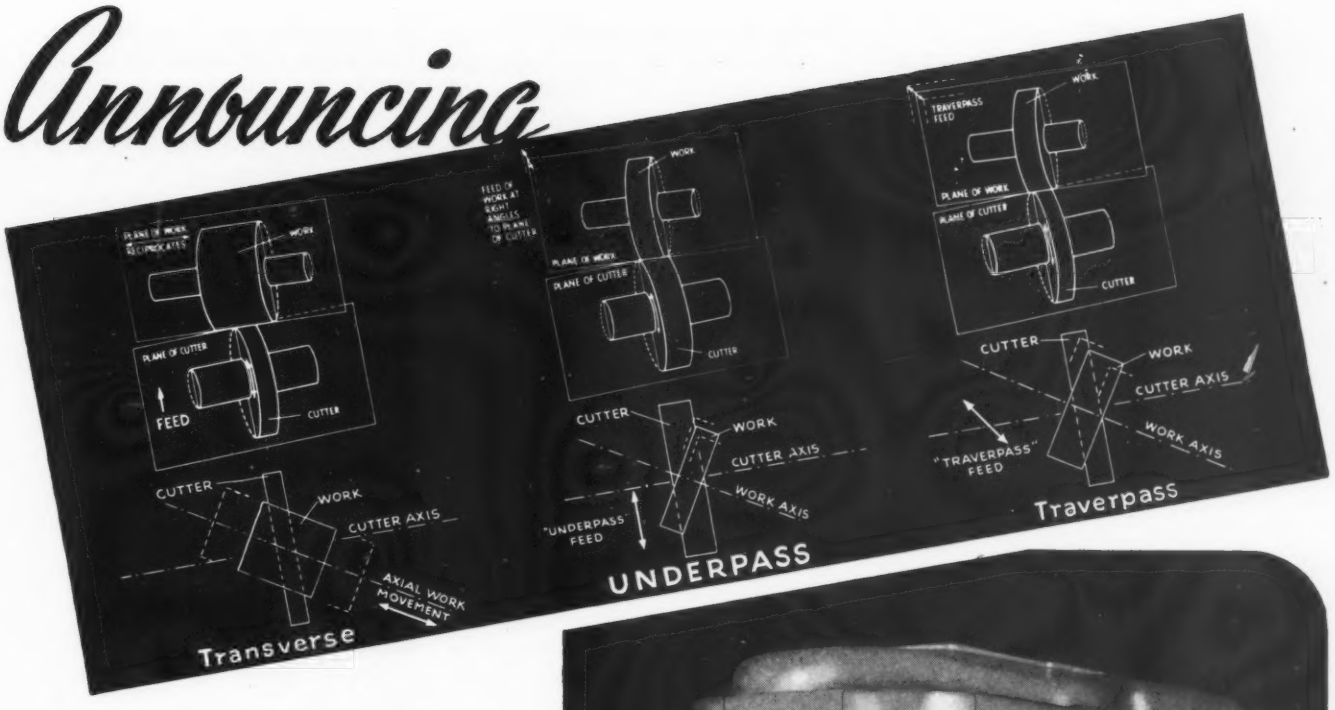
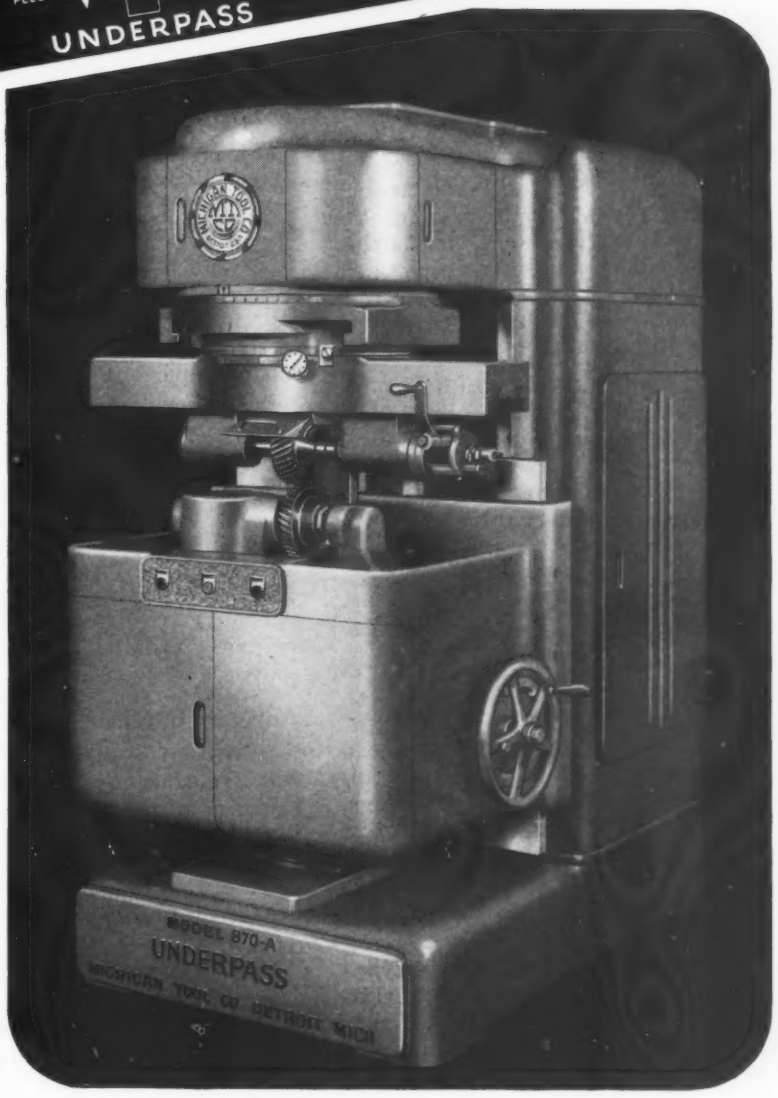
Announcing



the New 3-Way

MICHIGAN 870-A UNDERPASS

Gear Finisher



The new Michigan 870-A Gear Finisher not only brings UNDERPASS GEAR FINISHING to a new peak of accuracy, efficiency and speed (12 to 55 seconds, depending on the gear), but also makes available *in the same machine* two other pre-selective methods of gear finishing:

"Transverse" shaving for extremely wide face gears and splines and

"Traverpass" shaving for finishing fairly wide gears with narrow cutters (faster than "Transverse", although not as fast as "Underpass").

Also available (Model 870) without the vertical feed used with the transverse shaving process.

FASTER LOADING AND UNLOADING:
Quick acting camlock tailstock; work always located *above* cutter; self-clearing "over-center" machine guard.

FASTER SET-UP:
Merely rotate head-slide to select type of finishing method desired; all electric cycle controls in "sealed" dust-protecting compartment.

SMOOTHER OPERATION:
Head slide operated through Cone-Drive gearing (more teeth in contact—more contact per tooth).

Write for Bulletin No. 870A47

ORIGINATORS of GEAR-SHAVING

MICHIGAN TOOL COMPANY

7171 E. McNICHOLS ROAD DETROIT 12, U.S.A.

Stainless Steel

CRUCIBLE STEEL CO. OF AMERICA, 405 Lexington Ave., New York 17, N. Y. Data Sheet on Rezistal 302 stainless steel, giving composition, physical and mechanical properties, data on machining, hardening, and welding, and typical applications. 24

Flexible Couplings

CLIMAX FLEXIBLE COUPLING CO., 863 E. 140th St., Cleveland 10, Ohio. Bulletin 51, descriptive of the Climax Type C flexible couplings incorporating a new principle of design which gives increased capacity and maximum flexibility in shock absorption.....25

Precision Measuring Instruments

GAERTNER SCIENTIFIC CORPORATION, 1201 Wrightwood Ave., Chicago 14, Ill. Booklet entitled "A Survey of Precision Instruments," containing a complete list of the company's precision measuring instruments and services.....26

Pneumatic Measuring Machines

MERZ ENGINEERING CO., 206 S. Harding St., Indianapolis 7, Ind. Booklet describing the principle of operation and new features of the Merz line of "New-Matic" measuring machines, for high-speed precision gaging and sorting.....27

Ball-Bearing Overhead Trolley

LINK-BELT CO., 2410 W. 18th St., Chicago 8, Ill. Folder 2241, illustrating and describing the Link-Belt ball-bearing overhead conveyor trolley. Includes dimensions, weights, trolley ratings, chain pulls, prices, etc. 28

Steam-Platen Presses

BALDWIN LOCOMOTIVE WORKS, Eddystone, Pa. Bulletin 254, descriptive of the line of Southwark steam-platen presses for fabricating grinding wheels, molded rubber goods, polished plastic sheets, and many other parts.....29

Welding Fume Exhauster

MINE SAFETY APPLIANCES CO., Braddock, Thomas, and Meade Sts., Pittsburgh 8, Pa. Bulletin CU-1, illustrating and describing a new portable welding fume exhauster especially suited for operations in confined quarters.....30

Multi-Slide Machines

U. S. TOOL CO., INC., Ampere (East Orange), N. J. Bulletin 15, containing complete data on the Multi-Slide machines made by the company, including two new sizes, for the fabrication of precision parts from coil stock.....31

Fluids and Lubricants

CARBIDE AND CARBON CHEMICALS CORPORATION, 30 E. 42nd St., New York 17, N. Y. Bulletin 6500, discussing properties and uses of "Ucon" fluids and lubricants used in machine lubrication and in hydraulic applications. 32

Toolmaker's Microscope

GEORGE SCHERR CO., INC., 199 Lafayette St., New York 12, N. Y. Circular containing the reprint of an article on the uses of the toolmaker's microscope for the high-precision measuring and checking of a variety of work.....33

Burring Tools

PRATT & WHITNEY DIVISION NILES-BEMENT-POND CO., West Hartford 1, Conn. Booklet entitled "Bur-ology," containing much important information on the uses and abuses of burring tools. 34

Electric Equipment

SQUARE D CO., 6060 Rivard St., Detroit 1, Mich. Condensed catalogue (Digest No. 130), covering electrical equipment made by the company, including safety switches, circuit-breakers, motor control devices, etc. 35

Annealing Furnaces

SURFACE COMBUSTION CORPORATION, Toledo 1, Ohio. Bulletin SC-135, describing the annealing of ferrous and non-ferrous metals in Surface Combustion standard rated furnaces of direct-fired and prepared-atmosphere types. 36

Force-Feed Lubricators

MANZEL BROTHERS CO., Buffalo, N. Y. Catalogue 25-D, describing the principle of operation and applications of Manzel force-feed lubricators for the positive and automatic lubrication of cylinders and bearings. 37

Hydraulic Elevating Tables

LYON-RAYMOND CORPORATION, 3948 Madison St., Greene, N. Y. Bulletin 231, descriptive of portable hydraulic elevating tables for die handling, strip and sheet feeding, work positioning, loading of trucks, etc. 38

Aluminum Gravity Conveyors

RAPIDS-STANDARD CO., INC., Department AB-145, 342 Peoples National Bank Bldg., Grand Rapids 2, Mich. Bulletin describing the features of a newly announced aluminum rapid-wheel gravity conveyor. 39

Coolant for Machine Tools

ANDERSON OIL CO., Portland, Conn. Booklet descriptive of the development of a new coolant known as "Lusol," its performance and uses. Actual results obtained on modern machine tools are described. 40

Bronze Welding Rods

TITAN METAL MFG. CO., Bellefonte, Pa. Circular on Titan bronze welding rods, giving the approximate chemical and physical properties of seven types of welding alloys. 41

Oil Purification Equipment

HONAN - CRANE CORPORATION, 912 Sixth St., Lebanon Ind. Special issue of a periodical entitled "Clean Oil," dealing with problems involved in metal-machining operations. 42

Test-Bar Designs

NON-FERROUS INGOT METAL INSTITUTE, 308 W. Washington St., Chicago, Ill. Reprint of an article entitled "A Comparison of Test Bar Designs Cast in 85-5-5-5 Alloys." 43

Multiple Drill Heads

U. S. DRILL HEAD CO., Cincinnati 4, Ohio. 1948 catalogue illustrating and describing various adjustable multiple drill heads for drilling, reaming and tapping operations. 44

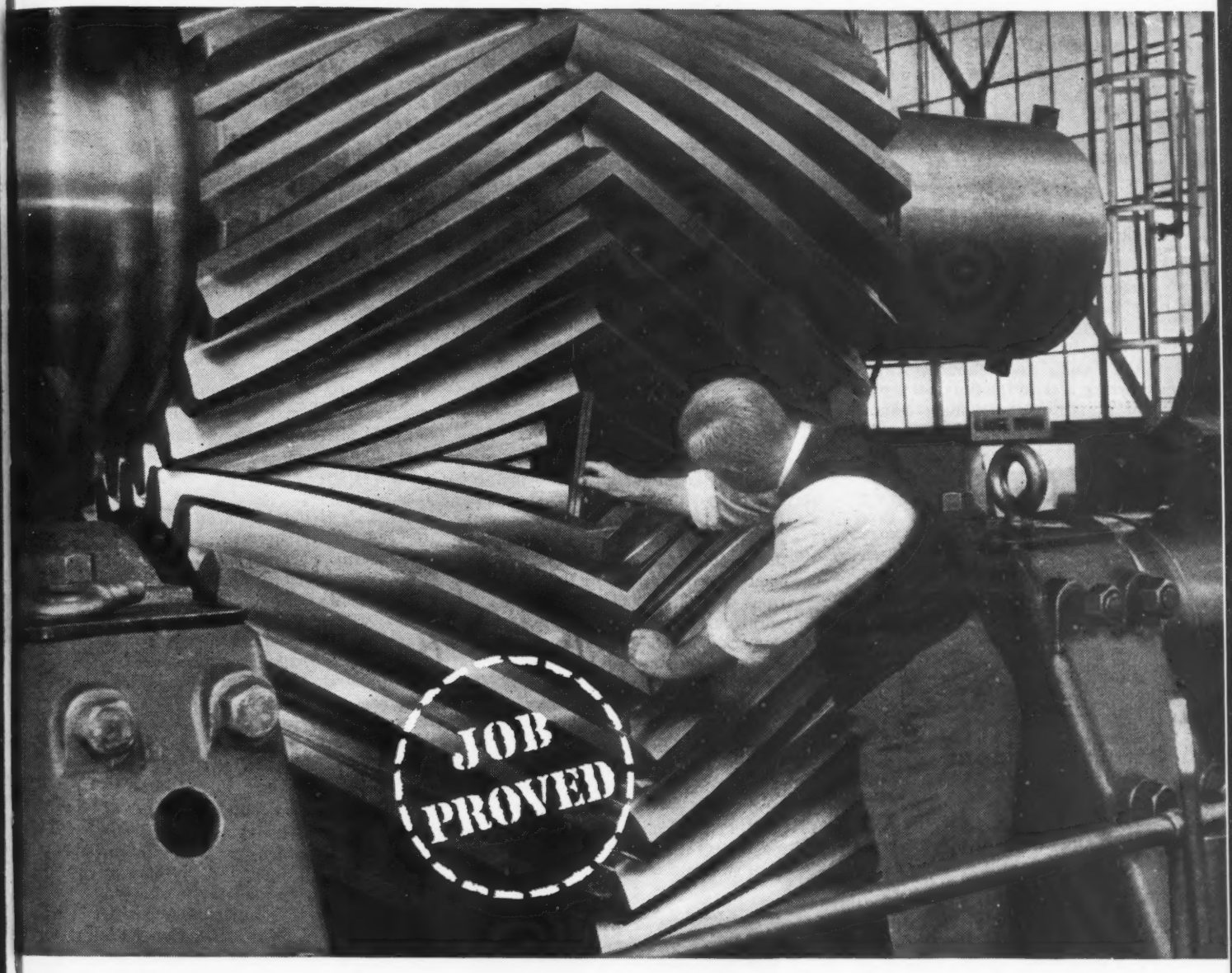
Arc-Welders

HOBART BROTHERS CO., Troy, Ohio. Circular descriptive of the Hobart 200-ampere gas-drive multi-range arc-welder with remote control. 45

Heat-Treating Equipment

LINDBERG ENGINEERING CO., 2444 W. Hubbard St., Chicago 12, Ill. Booklet entitled "How to Plan your Tool-Room Heat-Treating Department." 46

Production Up 22% on 44-Inch Pinion Gears



SUNICUT . . .

Enables Gear Manufacturer to Increase Feed, Speed, and Tool Life; and to Improve Finish

Since changing to Sunicut, a manufacturer of steel-mill gears has increased production by 22%, improved finish, and added greatly to the life of his gear cutters.

Operation: Cutting 44" herringbone gears.
Machine: Dominion herringbone gear generator.
Materials: Stainless steel, high carbon steel, bronze, other alloys.
Cutting Oil: Sunicut.

This case is just one of thousands in which experienced production men have found that Sun "Job Proved" cutting oils help to increase production and to improve quality as well.

Sunicut is a clear, free-flowing cutting oil, produced by an exclusive Sun process. It has high lubricating value and has excellent heat-dissipating and anti-weld properties. It makes possible heavy cuts at high speed while accuracy and satin-smooth finish are maintained. For full information call your Sun Cutting Oil Engineer or write Department M11.

SUN OIL COMPANY • ***Philadelphia 3, Pa.***
In Canada: Sun Oil Company, Ltd.—Toronto and Montreal

SUN
SUNOCO
INDUSTRIAL PRODUCTS

News of the Industry

California

KELLER TOOL CO., Grand Haven, Mich., announces that its Los Angeles branch is now occupying offices and display rooms at 507 W. Washington Boulevard.

Illinois and Indiana

HARVILL CORPORATION announces the acquisition of a third die-casting plant at 4358 Roosevelt Road, Chicago, Ill. This unit will be equipped to handle the complete process from the design and manufacture of die-casting dies to the finished production of aluminum, zinc, magnesium, and brass castings. Operations will be conducted by a wholly owned subsidiary of the company, to be known as HARVILL MID WEST CORPORATION.

ROBERT B. SEGER and ANDREW L. OLSON, formerly superintendent and assistant superintendent, respectively, of the Lindberg Steel Treating Co., Chicago, Ill., have acquired the ownership and management of the CHICAGO STEEL TREATING CO., 333 N. California Ave., Chicago.

VICTOR MFG. & GASKET CO., W. Roosevelt Road, Chicago, Ill., has acquired an additional building at 3636 Iron St., Chicago, which will make available a floor space of 200,000 square feet for storage, assembly, packaging, and shipping.

DIE-MOLD CORPORATION, 259 E. Erie St., Milwaukee 2, Wis., has appointed the CONANT TOOL & ENGINEERING CO., 347 W. 107th St., Chicago 28, Ill., sales representative of the company for Illinois, Indiana, Iowa, and parts of Wisconsin.

KELLY REAMER CO., Cleveland, Ohio, has appointed the MILROY STEEL & SUPPLY CO., Indianapolis, Ind., sales and engineering representative of the company for the state of Indiana.

New England

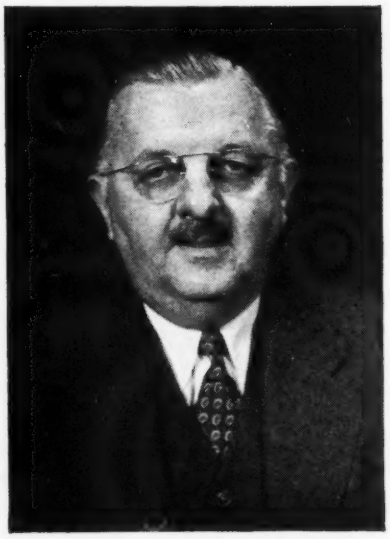
V. E. LYSAGHT has assumed the direction of sales of the Andrew C. Campbell Division, American Chain & Cable Co., Inc., Bridgeport, Conn., succeeding R. J. SOUTHWELL, who has resigned. The Campbell products include a complete line of abrasive cutting machines and nibbling machines. Mr. Lysaght is also in charge of engineering and sales of the hardness testers manufactured by the Wilson Mechanical Instrument Co., an associate company of the American Chain & Cable Co.

NINA ORMSBY, for forty-eight years employed by the L. S. Starrett Co., Athol, Mass., in the Steel Tape Division of the company, recently retired under the company's pension plan. In recognition of her long service, she was presented with a United States Savings Bond by Arthur H. Starrett, president, at a simple ceremony attended by top officials of the company.

New York and New Jersey

CHARLES J. KOLB has been appointed manager of industrial relations for the Niagara Machine & Tool Works, Buffalo, N. Y., manufacturer of machinery and tools for the fabrication of sheet metal. Mr. Kolb was previously director of industrial relations with the Colonial Radio Corporation and the Pierce-Arrow Motor Car Co. The Niagara Machine & Tool Works has recently completed a large addition to its plant.

JAMES E. MOSSELL has been appointed sales manager of the Machine Tool Division of the Buffalo Forge Co., Buffalo 5, N. Y., succeeding the late Earle G. Leonard. Mr. Mossell has been associated with the company for thirty-five years, during more than twenty-five of which he has been connected with machine tool sales. He has represented the company in Pennsylvania, Michigan, Canada, and New England, and has also been active in home office sales.



James E. Mossell, Sales Manager of Machine Tool Division of the Buffalo Forge Co.

INTERNATIONAL NICKEL CO., 67 Wall St., New York 5, N. Y., has appointed the METAL GOODS CORPORATION, 817 Seventeenth St., Denver 1, Colo., distributor of primary nickel for alloying purposes and mill forms of Monel, nickel, and Inconel in the states of Colorado, Wyoming, and New Mexico.

HARRY E. SWEET has been appointed factory manager of Aircraft Screw Products Co., Inc., Long Island City, succeeding EUGENE LANG, who has resigned. Mr. Sweet was formerly factory manager of the Kellett Aircraft Corporation.

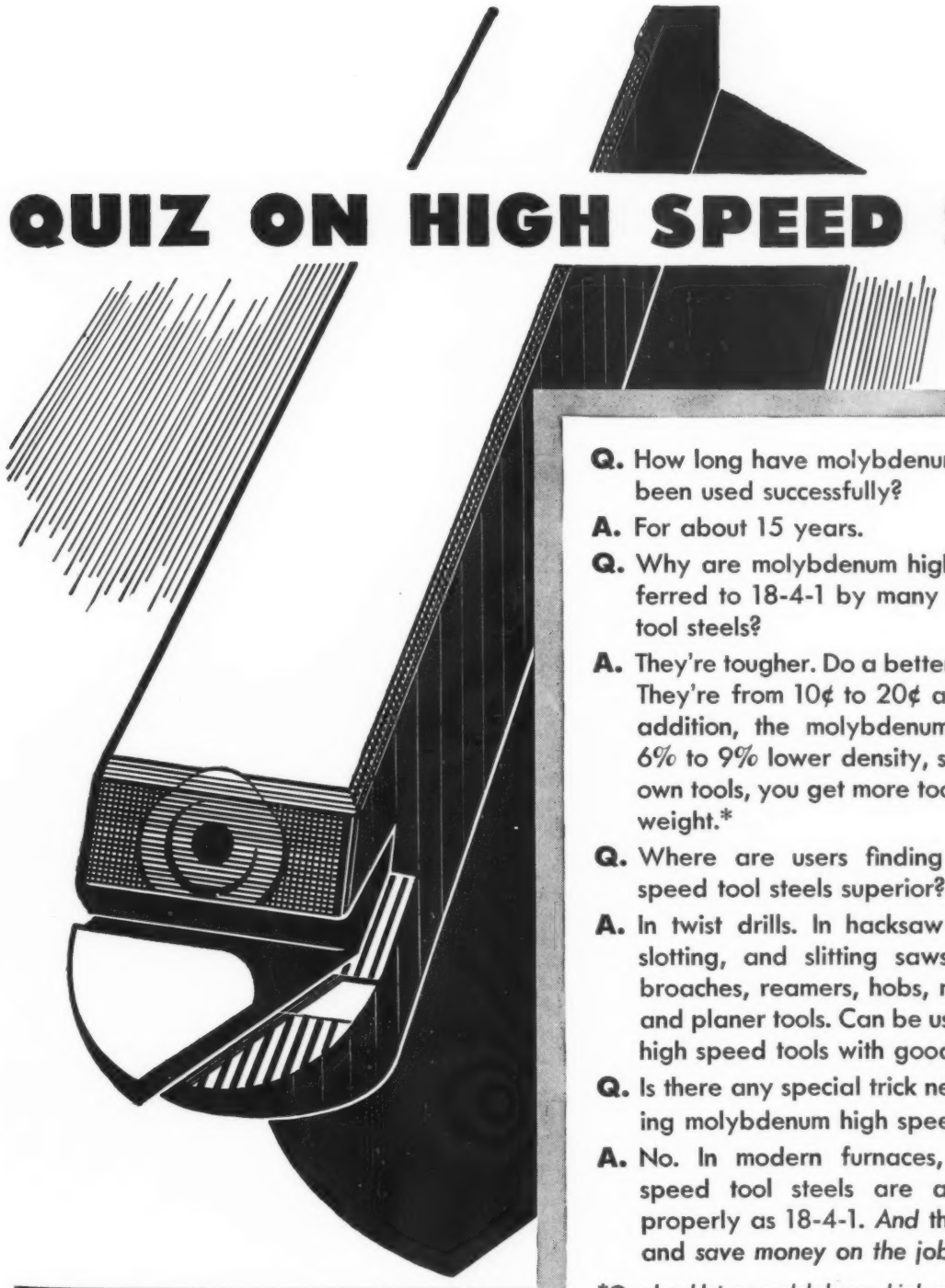
PAUL J. MOORE has been appointed to the newly created position of director of sales and engineering for the Crocker-Wheeler Electric Mfg. Co., of Ampere, N. J., a division of the Joshua Hendy Corporation. Mr. Moore was formerly connected with the motor engineering and sales departments of the General Electric Co., Schenectady, N. Y.

Ohio

H. C. EDWARDS, chief engineer of research and development with the Timken Roller Bearing Co., Canton, Ohio, has been appointed director of research and development to succeed J. F. LEAHY, who retired October 1, after forty-five years of service with the company. WALTER F. GREEN, assistant manager of research and development, will become manager. H. M. SHANK, Boston branch manager of the Service-Sales Division of the company, has been appointed Detroit branch manager to succeed J. D. JESSEPH, who has resigned. FRANK M. BARRY, formerly a field representative in the New York office, has been made manager of the Boston branch.

BENKERT & DUER, INC., is a new organization formed by LOUIS M. BENKERT and PAUL DUER to provide manufacturers of resistance welding equipment in the east central states with sales representation. The company will maintain three offices at 4820 Olentangy Blvd., Columbus 2, Ohio; 859 Leader Bldg., Cleveland 14, Ohio; and 325 Bankers Trust Bldg., Indianapolis, Ind. The new organization will represent the Progressive

QUIZ ON HIGH SPEED STEELS



Q. How long have molybdenum high speed steels been used successfully?

A. For about 15 years.

Q. Why are molybdenum high speed steels preferred to 18-4-1 by many large consumers of tool steels?

A. They're tougher. Do a better job for less money. They're from 10¢ to 20¢ a pound cheaper. In addition, the molybdenum steels have from 6% to 9% lower density, so if you make your own tools, you get more tools for a given gross weight.*

Q. Where are users finding molybdenum high speed tool steels superior?

A. In twist drills. In hacksaw blades. In milling, slotting, and slitting saws. In taps, chasers, broaches, reamers, hobs, milling cutters, lathe and planer tools. Can be used for all classes of high speed tools with good results.

Q. Is there any special trick needed in heat treating molybdenum high speed tool steels?

A. No. In modern furnaces, molybdenum high speed tool steels are as easy to harden properly as 18-4-1. *And* they cost much less—and *save money on the job.*

**Our booklet on molybdenum high speed steels will give you proof of these statements. Write for it.*

MOLYBDIC OXIDE—BRIQUETTED OR CANNED • FERROMOLYBDENUM • "CALCIUM MOLYBDATE"
CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.

Climax Molybdenum Company
500 Fifth Avenue · New York City

MOLY

Welder Co. exclusively in Ohio (except Toledo), western Pennsylvania, northern Kentucky, West Virginia, and most of Indiana. Mr. Benkert was formerly general sales manager of that company. He and Mr. Duer will make their headquarters in Columbus.

HERBERT W. SMITH has been appointed direct European representative, with headquarters at Birmingham, England, for the National Acme Co., Cleveland, Ohio, builder of Acme-Gridley multiple-spindle bar and chucking automatics. Mr. Smith, a member of the Institute of Production Engineers, has been in the machinery business since his boyhood apprenticeship with a London company. For the last thirteen years, he has specialized in multiple-spindle engineering for National Acme representatives B.S.A. tools, Ltd., of Birmingham. He now assumes direct representation for the company's sales-engineering requirements in England, Sweden, and Continental Europe.

ROBERT B. HAYNES has been promoted to the newly created position of works manager of the Spicer Mfg. Division, Dana Corporation, Toledo, Ohio. He has been with the company since 1945, recently serving as equipment manager.

AMPCO METAL, INC., Milwaukee 4, Wis., has appointed the WELDING & CUTTING SUPPLY CO., 2401 Carnegie Ave., Cleveland 15, Ohio, distributor of Ampco-Weld resistance welding electrodes and alloys in the Cleveland area.

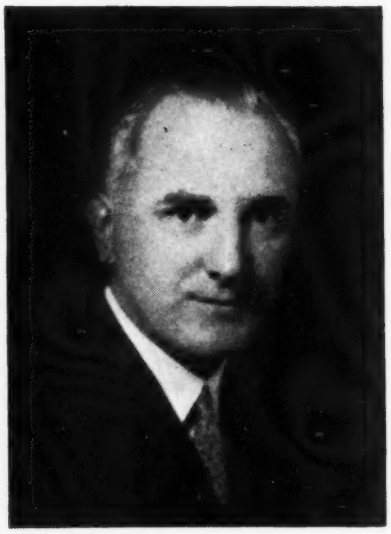
C. W. BLISS has been appointed controller and HELEN HEINMILLER assistant secretary of the Warner & Swasey Co., Cleveland, Ohio.

R. H. NEWTON has been appointed to a newly created office of manager of dealer sales for the Lincoln Electric Co., Cleveland, Ohio.

Pennsylvania

JOHN E. PAYNE, formerly manager of industrial sales of the Westinghouse Electric Corporation, Pittsburgh, Pa., has been named manager of all industry sales departments. R. S. KERSH, manager of the company's Houston Tex., office since 1942, will succeed Mr. Payne as manager of industrial sales.

HARRY M. REED has been elected secretary of the board of directors of Vanadium-Alloys Steel Co., Latrobe, Pa., succeeding the late Fred P. Underwood.



H. P. Hobart, Vice-president in Charge of Lubricating Oil Sales of the Gulf Oil Co.

H. P. HOBART was elected vice-president in charge of lubricating oil sales of the Gulf Oil Co., Pittsburgh, Pa., at a recent meeting of the board of directors, and R. M. BARTLETT was elected vice-president in charge of fuel oil sales. Mr. Hobart has been connected with the company since 1919, and Mr. Bartlett since 1926.

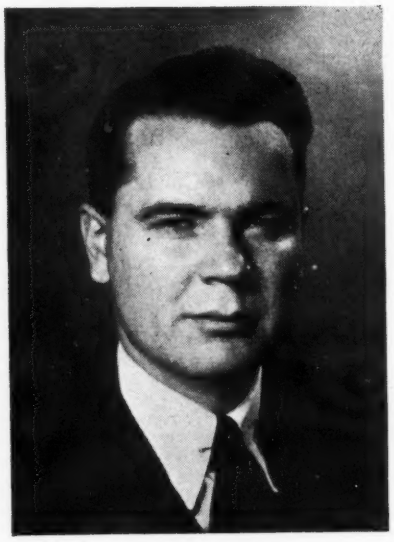
ALLEGHENY LUDLUM STEEL CORPORATION, Pittsburgh, Pa., has acquired a government-constructed steel plant in Dunkirk, N. Y., operated by the corporation during the war. This plant will be converted for the production of stainless steel wire. The wire-making facilities from another shop of the company will be removed to the newly acquired plant, and much new equipment will be installed. The company plans to spend $500,000 in the conversion of the plant. It is hoped to start operation in two or three months.

HENRY N. MULLER, JR., has been made manager of the entire educational department of Westinghouse Electric Corporation, Pittsburgh 30, Pa. He was formerly manager of graduate student training, and will be succeeded in that post by Guy Kleis, previously supervisor of engineering training.

Michigan and Wisconsin

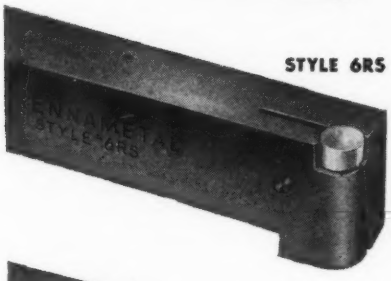
L. RAY and FRED L. PHIPPS, Michigan representatives of the Verson Allsteel Press Co., Chicago, Ill., have made arrangements with A. C. BERGES to handle the Verson line of hydraulic and mechanical presses and press brakes in the Detroit territory. Mr. Berges was formerly Michigan sales manager for the E. W. Bliss Co. His office will be at 2970 Grand Blvd., Detroit, Mich.

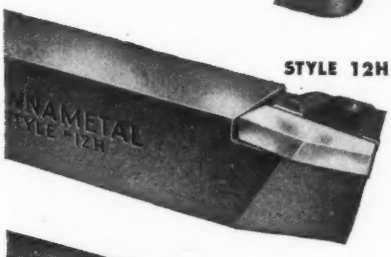
CLARENCE SNYDER was elected chairman of the board of directors of the Snyder Tool & Engineering Co., Detroit, Mich., at the recent annual meeting of the board. HOWARD N. MAYNARD was made president and treasurer, and KENNETH B. HOLLIDGE vice-president and secretary, as well as a director of the company. Mr. Snyder was one of the original founders of the company twenty-two years ago. Mr. Maynard joined the organization twelve years ago as a clerk, and has successively held the positions of secretary, secretary-treasurer, and vice-president, treasurer, and

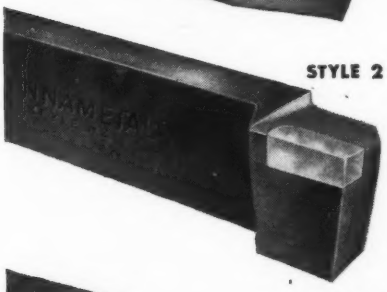


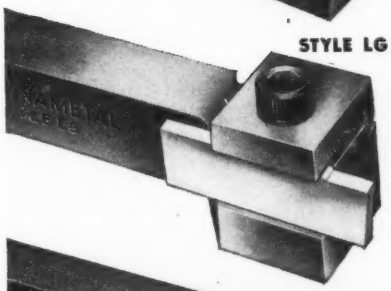
(Left) Howard N. Maynard, New President and Treasurer of the Snyder Tool & Engineering Co. (Right) Kenneth B. Hollidge, Newly Elected Vice-president and Secretary

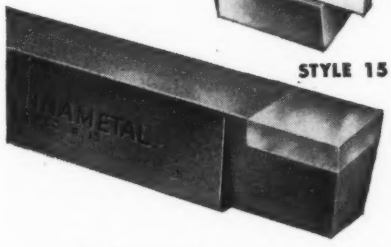
KENNAMETAL Cutting Tools











The Kennametal tools shown above are representative of more than 60 standard styles—each designed to increase the productivity of machine tools, and reduce tooling costs, on specific metal-cutting jobs.

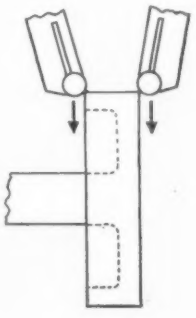
INCREASE THE PRODUCTIVE CAPACITY OF MACHINE TOOLS UP TO 500%

Hard, durable Kennametal cemented carbide cutting tools can turn out from two to five times as much as high speed steel tools on the same machine and in the same time, because—

—they make possible machining at speeds 3 to 10 times as fast as with high speed steel tools,

—last many times as long before needing resharpened, thereby greatly reducing machine downtime, and

—cut tougher steels and hard, abrasive cast-iron; as well as steel in the hardened state, thus often saving annealing and rehardening operations.



It's good business to invest thousands of dollars in faster, more powerful machine tools. It's even better business to invest a few extra pennies in long-lived Kennametal cutting tools that enable the machine tool to produce more, in less time, at less cost. For example:

On the straddle-facing job sketched at the right, recently-developed Kennametal "clamped-in solid round" tools (Style 6RS illustrated) have increased production 20%, and are saving $10.00 per tool per day. This is not extraordinary performance—it is a typical example of the outstanding results obtained by using Kennametal cemented carbide instead of other tool materials, and skillfully engineering it to the job.

Kennametal tool engineers are at your service to help you get more work from your machine tools. Call upon them. ● Kennametal standard tools, that will handle up to 90% of all machining jobs, are listed and priced in Catalog 47. Write for a copy.

TRADE MARK REG. U. S. PAT. OFF.

KENNAMETAL *Inc.*

LATROBE, PA.,

MANUFACTURERS OF SUPERIOR CEMENTED CARBIDES AND CUTTING TOOLS THAT INCREASE PRODUCTION

director prior to his present appointment as president. Mr. Hollidge became connected with the company four years ago as personnel director, and was later made secretary. His present responsibilities include personnel, labor relations, public relations, and advertising.

J. A. HERRINGTON, formerly president of Knu-Vise Inc., Detroit, Mich., recently taken over by the Lapeer Mfg. Co., Lapeer, Mich., has been elected president of the latter concern. William Uren, for twenty years master mechanic in charge of jigs and fixtures with the Murray Corporation, is plant superintendent.

INSPECTION SERVICE CO., Center Line, Mich., has been organized by the CARBO-TUNGSTEN PRODUCTS CO., of Center Line to provide inspection service for manufacturers who are having contract or sub-contract work done in the Detroit area and who have no inspectors on their pay-rolls.

HYDRAULIC MACHINERY, INC., 12825 Ford Road, Dearborn, Mich., has appointed the CUNHA INTERNATIONAL CORPORATION export agent for the company's new three-ounce capacity injection molding machine.

CARBOLOY COMPANY, INC., Detroit, Mich., has appointed the GEORGE W. HUBBARD HARDWARE CO., 602 Mill St., Flint, Mich., distributor of Carboloy tools.

DAVID B. HILL has been appointed district field engineer in the Atlanta, Ga., office of the Chain Belt Co., Milwaukee, Wis. He was previously an application engineer in the Conveyor Division of the company at Milwaukee.

FREDERICK K. KRELL has been appointed Chicago district sales representative of the Globe Steel Tubes Co., Milwaukee 4, Wis. He has been with the company since 1942, formerly holding the post of sales service supervisor.

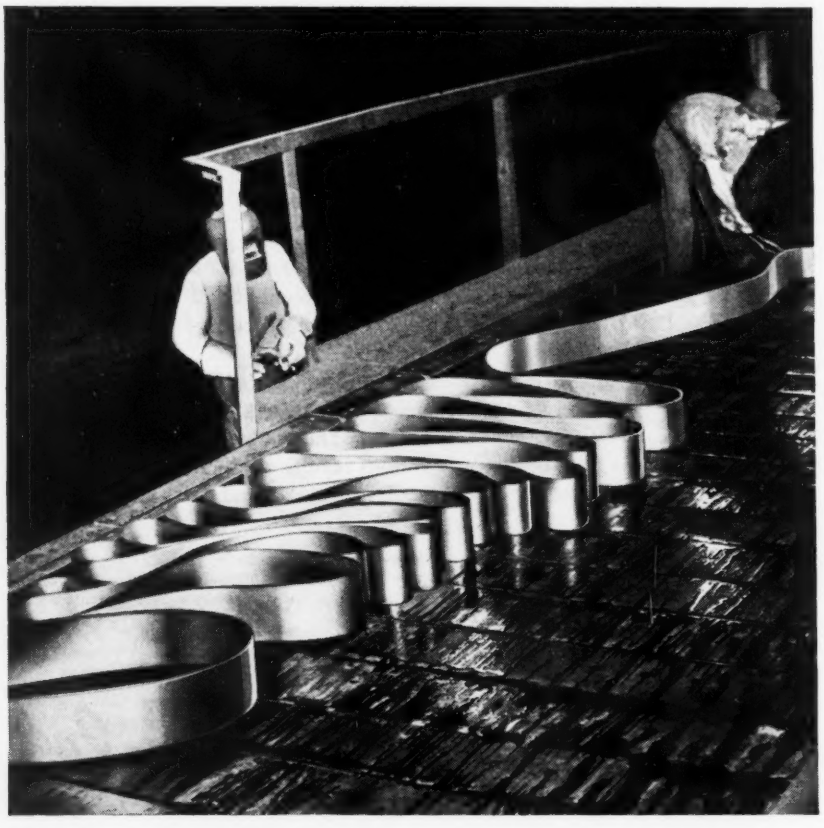
* * *

Production of Strip Steel Demonstrated

In order to demonstrate the scope of rolling mill operations, the Acme Steel Co. recently conducted tours through its strip steel mill at Riverdale, Ill.—one of the largest in the country. This plant has three hot mills that produce strip from 3/4 inch to 22 inches wide and from 0.002 to 1/2 inch thick; and twenty-two cold mills that produce strip from 1/4 inch to 24 inches wide and from 0.002 to 3/8 inch thick. The total yearly capacity of these units is 745,000 tons.

During the hour and one-half visit, guests saw steel hot-rolled, cold-rolled, pickled, cut into strips, and coated with zinc in the world's largest electro-galvanizing tanks for strip steel. They followed the manufacturing of strip steel from red-hot slabs to finished, treated coils.

In addition to the manufacturing processes, visitors were shown a quarter-mile of exhibits of other manufacturers of products made from strip steel ranging from tubing to electric toasters.



Red-hot Steel Strip on a Run-out Table at the Riverdale Plant of the Acme Steel Co. Here the Strip is Cooled, Caged, and Coiled for Shipment

* * *

Coming Events

NOVEMBER 2-5—Annual meeting of the NATIONAL TOOL AND DIE MANUFACTURERS ASSOCIATION at the Benjamin Franklin Hotel, Philadelphia, Pa. Executive secretary, George S. Eaton, 1412 Union Commerce Bldg., Cleveland, Ohio.

NOVEMBER 3-5 — NATIONAL ELECTRONICS CONFERENCE at the Edgewater Beach Hotel, Chicago, Ill. Further information can be obtained from H. S. Renne, 185 N. Wabash Ave., Chicago 1, Ill.

NOVEMBER 6-7—Fuels and lubricants meeting of the SOCIETY OF AUTOMOTIVE ENGINEERS, at the Hotel Mayo, Tulsa, Okla. Secretary and general manager, John A. C. Warner, 29 W. 39th St., New York 18, N. Y.

NOVEMBER 6-8—Annual convention of the manufacturers of Meehanite castings at the Hotel Carter in Cleveland, Ohio, under the auspices of the Meehanite Metal Corporation, 800 Pershing Square Bldg., New Rochelle, N. Y.

DECEMBER 1-3—Air Transport meeting of the SOCIETY OF AUTOMOTIVE ENGINEERS at the Hotel Continental, Kansas City, Mo. Secretary and general manager, John A. C. Warner, 29 W. 39th St., New York 18, N. Y.

DECEMBER 1-5—Annual meeting of the AMERICAN SOCIETY OF MECHANICAL ENGINEERS in Atlantic City, N. J.; headquarters, Chalfonte-Haddon Hall. Secretary, Clarence E. Davies, 29 W. 39th St., New York 18, N. Y.

DECEMBER 1-6—Twenty-first CHEMICAL INDUSTRIES EXPOSITION at the Grand Central Palace in New York City. For further information, address International Exposition Co., Grand Central Palace, New York 17.

DECEMBER 4-6—Annual meeting of the SOCIETY FOR EXPERIMENTAL STRESS ANALYSIS at the Hotel Pennsylvania, New York City. Further information

GENERAL PROPERTIES AND USES FOR MOLDED PLASTICS MATERIALS—5

Type	Filler	Colors	Applications	Notch Impact Ft.-Lb. per In.	Flexural Strength Pounds per Sq. Inch	Tensile Strength Pounds per Sq. Inch	Water Absorption, Per Cent 48 Hours	Heat Resistance, Continuous Deg. F.	Dielectric Strength, Volts per Mil, Step-by-step Test in Oil, ⅛-In. Specimen		Specific Gravity	Shrinkage Inch per Inch*	Bulk Factor†
									25° C.	100° C.			
Ethyl cellulose	.....	All colors, transparent, translucent, and opaque	Products requiring good strength at low temperatures, water resistance, toughness, weather resistance, and dimensional stability. Some forms used as rubber substitutes. Thermoplastic.	0.8 to 7.0	10,000	3000 to 8000	1.75	150	300	.....	1.13	0.002 to 0.008	3
Polystyrene	.....	All colors, transparent, translucent, and opaque	For parts requiring good electrical properties and resistance to chemicals. Has low gravity, zero moisture absorption, and good stability. Thermoplastic.	0.4 to 1.0	14,000	4000 to 9000	0.00	150	500	.....	1.07	0.002 to 0.006	2.5
Vinylidine chloride	.....	Unlimited	Extruded for chemical and water resistant tubing. Injection molded for chemical equipment, plating racks, and valve seats. Is used as wire insulation. Thermoplastic.	2.0	14,000	6000	0.01	160	300	.....	1.68	0.004 to 0.012	2.5
Methyl methacrylate	.....	All colors, transparent, translucent, and opaque	Excellent transparency and optical properties, low gravity, fair chemical resistance. Is used for lenses, decorative parts, nameplates, packages, etc. Thermoplastic.	0.2 to 0.4	12,000	5000	0.5	120	350	.....	1.18	0.002 to 0.006	2.5
Nylon	.....	Unlimited	Molding applications limited at the present time.	0.7	8500	10,000	1.0	150	300	.....	1.10	.....	2.5

*See Data Sheet No. 598.
†See Data Sheet No. 598.

MACHINERY'S Data Sheet No. 597, November, 1947

Compiled by the Shaw Insulator Co.
Irvington, N. J.

GENERAL PROPERTIES AND USES FOR MOLDED PLASTICS MATERIALS—6

Type	Filler	Colors	Applications	Notch Impact Ft.-Lb. per In.	Flexural Strength Pounds per Sq. Inch	Tensile Strength Pounds per Sq. Inch	Water Absorption, Per Cent 48 Hours	Heat Resistance, Continuous Deg. F.	Dielectric Strength, Volts per Mil, Step-by-step Test in Oil, ⅛-In. Specimen		Specific Gravity	Shrinkage Inch per Inch*	Bulk Factor†
									25° C.	100° C.			
Copolymer vinyl chloride and vinyl acetate	.....	All colors, except a water white	Minimum cold flow at room temperature, good water and chemical resistance, good impact resistance, and is nonflammable. Some forms used as rubber substitute.	0.4 to 0.8	10,000	8000	0.1	130	375	.....	1.34	0.001	2.5
Copal	Asbestos	Red	Good electrical properties and arc resistance.	0.40	3000	.....	0.7	122	300	.....	1.50	0.003 to 0.004	6
Cold mold—nonrefractory	.....	Black and Brown	Wiring device parts, cooking ware handles to withstand oven temperatures. Best cold mold for appearance.	0.4	4500	.....	2.0	482	60	.....	2.00	0.015	2.5
Cold mold—refractory	.....	Gray	For arc deflectors, rheostat bases, and other parts requiring maximum heat and arc resistance.	0.6	5000	.....	0.05 to 0.15	1292	60	.....	2.20	Nil	2.5
Synthetic hard rubber	Mineral	Red	For electrical and ignition parts requiring good arc resistance and good dielectric properties at elevated temperatures.	0.32	7000	4000	0.08	175	370	370	1.77	0.0195 to 0.0225	2
Mycalex	Mineral	Gray	Radio and other high-frequency electrical applications requiring maximum heat and arc resistance.	.....	10,000	.....	0.0023	662	.....	380	3.11	Nil	.....
Mycalex	Mineral	Gray	General purpose electrical applications requiring low moisture absorption, high temperature and arc re-resistance.	.....	12,000	.....	0.001	482	.....	325	3.70	Nil	.....

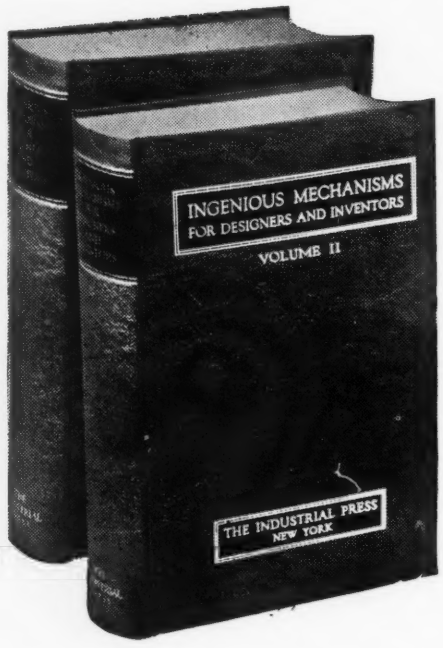
*Shrinkage values in table give amount of shrinkage in inches per inch of molding materials after they are molded under average conditions. Allowance must be made in the mold design to compensate for this shrinkage.
†Bulk factor is the ratio of the volume of compound before molding to the volume of the molded piece. Molds must be designed to allow sufficient space for loading the molding compound.

MACHINERY'S Data Sheet No. 598, November, 1947

Compiled by the Shaw Insulator Co.
Irvington, N. J.

Ingenious Mechanisms for Designers and Inventors

Two Books that Form a Complete Course of Study



To own these two volumes, that form a complete course of study, is to have a comprehensive encyclopedia of mechanical movements unparalleled in scope and usefulness. Each volume is an entirely independent treatise on mechanisms; both books are similar in size and general character, but the contents are different.

Every mechanism described and illustrated embodies some idea or principle likely to prove useful to designers or inventors. Volume I contains 536 pages and 300 illustrations; Volume II, 538 pages and 303 illustrations. Price, $8 set or $5 for either book separately.

THE INDUSTRIAL PRESS, 148 Lafayette Street, New York 13, N. Y.

Gear Design Simplified

Size 8-1/2 x 11 Inches

This book of working rules and formulas for designer and shop man, deals with spur gears, internal gears, straight-tooth and spiral-bevel gears, single- and double-helical gears, worm-gears, gear ratios (including transmissions of the planetary type) and the power-transmitting capacity of gears.

All gear problems are presented in simple chart form. These 110 charts, with 201 drawings illustrating all kinds of gear problems, are easy to use and you can locate quickly whatever rule or formula is desired. Worked-out examples of gear design show exactly how all rules (or the formulas, if preferred) are actually applied in obtaining the essential dimensions, angles, or other values. Price, $3 copy.

THE INDUSTRIAL PRESS, 148 Lafayette Street, New York 13, N. Y.

can be obtained from the Society, P.O. Box 168, Cambridge 39, Mass.

JANUARY 12-16, 1948—Annual meeting of the SOCIETY OF AUTOMOTIVE ENGINEERS at the Book-Cadillac Hotel, Detroit, Mich. Secretary and general manager, John A. C. Warner, 29 W. 39th St., New York 18, N. Y.

JANUARY 12-16, 1948—Second NATIONAL MATERIALS HANDLING EXHIBITION in the Public Auditorium, Cleveland, Ohio. Those interested can obtain further information from Clapp & Poliak, Inc., 350 Fifth Ave., New York 1, N. Y.

MARCH 15-21, 1948—Sixteenth annual meeting and Tool Exhibition of the AMERICAN SOCIETY OF TOOL ENGINEERS in Cleveland, Ohio. Harry E. Conrad, executive secretary, 1666 Penobscot Bldg., Detroit 26, Mich.

MARCH 18-19, 1948—Fourth annual meeting and exhibit of MAGNESIUM ASSOCIATION at the Pennsylvania Hotel, New York City. Further information can be obtained from the Association, 30 Rockefeller Plaza, New York 20, N. Y.

MARCH 22-24, 1948—CHICAGO PRODUCTION SHOW and TECHNICAL CONFERENCE at the Stevens Hotel, Chicago, Ill., under the sponsorship of Chicago Technical Societies Council, 53 West Jackson Boulevard, Chicago 4, Ill.

New Books and Publications

INDUSTRIES ANSWERIGHT. By Charles Z. Smith, Sr. 440 pages, 8 1/2 by 11 inches. Published by the Genaflash Co., 105 Grove Ave., Albany 3, N. Y. Price, $6.

Written as an on-the-job reference or home-study refresher for mechanics, engineers, inspectors, or designers, this book presents hundreds of practical problems taken from engineering and production departments. Outlines for determining dimensions of standard and special thread gages, dimensions of several thousand plug and ring thread gages in tabular form, and detailed drawings of thread plug gages, thread ring gages, and interlocking and staggered tooth cutters are included. A slide-rule digit system is explained in detail. Eight-decimal-place tables of trigonometric functions, its tables for converting hundredths of a millimeter into inches and hundredths of an inch into millimeters, and a table for converting a decimal part of a degree directly into minutes and seconds are also given.

Among the many problems solved are roll and ball measurements for checking dimensions; location of radii for jig boring dimensions; checking the face angle of bevel gears on a sine bar; corrected tool steps on circular and flat form tools; dimensions for laying out the developed surface of a cone, etc.

PRACTICAL DESCRIPTIVE GEOMETRY. By S. E. Rusinoff. 259 pages, 5 1/2 by 8 1/2 inches. Published by The American Technical Society, Drexel Ave. at 58th St., Chicago 37, Ill. Price, $3.50.

Practical application and simplicity of treatment are distinguishing features of this new text-book on descriptive geometry. The aim of the author, who is associate professor of mechanical engineering at the Illinois Institute of Technology, is to explain the basic principles of the subject and show how descriptive geometry is applied in the automotive, machine tool, aviation, and steel industries, and related fields.

The first two chapters present a condensed review of engineering drafting and the application of basic principles of geometry and drafting. Subsequent chapters apply the principles of descriptive geometry in the designing and assembling of machines and parts. The introduction of a principle is followed by its application to an industrial problem. The last chapter of the book deals with the solution of miscellaneous problems encountered in the shop and drafting-room. Useful tables, including trigonometric functions, are given in the appendix.

THE USE OF MACHINERY'S HANDBOOK. By Alex Leuchtman and A. A. Vezzani. Prepared under the joint sponsorship of the United Automobile Workers, C.I.O., and the University of Michigan, Ann Arbor, Mich. Price, $1 a single copy; 75 cents per copy in lots of five or more.

This little manual has been prepared to aid the apprentice in using MACHINERY'S HANDBOOK as a working tool. It is not intended to serve as a substitute for a teacher, but rather as an aid in the teaching process. No attempt has been made to cover the entire HANDBOOK. Instead, a careful selection has been made of the material considered most suitable for apprentices in the metal trade. Eighteen lessons are presented for the student to work out by the aid of the data given in the HANDBOOK. The lessons are arranged to advance from the simple to the more complex. Attention should be called to the fact that the page numbers given as a reference in the manual were taken from the Eleventh Edition of the HANDBOOK, and while the same material is found in other editions, the page numbers may vary.

LESSONS IN ARC WELDING (Third Edition). 158 pages, 5 1/2 by 8 1/2 inches. Published by the Lincoln Electric Co., Cleveland 1, Ohio. Price, 50 cents in the United States; 75 cents elsewhere.

This book (now in its third edition) consists of a series of lessons which form the basis of instruction in The Lincoln Arc Welding School. They present in a concise manner certain fundamental facts on arc-welding, which will aid the welder to use process successfully. There are thirty-two lessons in the book included in the basic course, as well as a number of advanced lessons. In addition, there is a series of questions and answers to be used with each lesson. Much new material has been added in this edition.

MANUAL OF FOUNDRY AND PATTERN SHOP PRACTICE. By Otis J. Benedict, Jr. 361 pages, 4 3/4 by 7 3/4 inches. Published by the McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 18, N. Y. Price, $3.25.

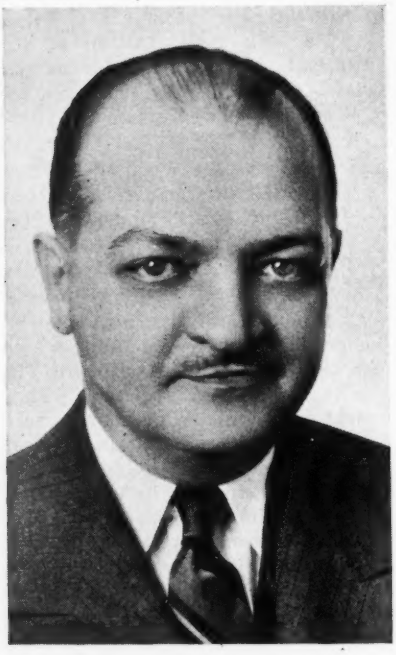
A detailed presentation of the fundamental processes of pattern design and construction, molding, cupola operation, and pouring, cleaning, and inspection of castings is given in this book. The first part of the book deals with the fundamental principles of foundry practice as applied to the production of gray iron castings, while the second part is devoted to pattern design and construction.

A PRACTICAL THEORY OF MECHANISMS. By Paul Grodzinski. 166 pages, 4 by 6 1/2 inches. Published by Emmott & Co., Ltd., 31 King St., W., Manchester 3, England. Price, 7/6d.

This little book is an introduction to the basic principles underlying the theory of mechanisms, and is a revised translation of the author's German publication. It includes chapters on Chains of Links and Element Pairs; the Screw Mechanism; the Four-bar Link and Derived Mechanisms; Cam Mechanisms; Gear Trains; Belt and Fluid Drives; and Ratchets.

LIGHTING HANDBOOK. 260 pages, 7 3/8 by 4 1/4 inches. Published by the Westinghouse Electric Corporation, Lamp Division, Bloomfield, N. J. Price, $2.

Obituaries



Joseph L. Trecker

Joseph L. Trecker, president of the Kearney & Trecker Corporation, Milwaukee, Wis., builder of precision and production machine tools for milling and boring, died suddenly of a heart attack in his office on October 7 at the age of forty-five years. In 1925, soon after graduating from Iowa State College, Mr. Trecker joined the company, which was founded by his father and E. J. Kearney in 1898. He was made a director in 1928, treasurer in 1934, vice-president in 1936, executive vice-president and director in 1942, and president in July, 1947. He was also vice-president and director of the Kearney & Trecker Products Corporation, as well as a director of Controls Laboratories, Inc., and president of the Antea Corporation.

Mr. Trecker was widely known in industry throughout the country. During the war, he served in various capacities in the National Defense Program at Washington. He was a special advisor to the Secretary of War, served as sub-contracting and engineering advisor in the Office of Production Management, and was a member of a special committee working with Army and Navy officials on problems concerned with the machine tool industry. When the industry was completely geared to the war effort, Mr. Trecker returned to his own business, but continued to serve as advisor to R. A. Patterson, then Under Secretary of War.

Because of his knowledge of the machine tool business, he has been recognized as a spokesman for the industry in this country. He was recently named a member of the Machine Tool Committee of the Army and Navy Munitions Board, an agency designated by President Truman to formulate plans and policies for industrial mobilization in emergency. He had made several trips abroad to study European conditions. Mr. Trecker was a member of the National Machine Tool Builders' Association, of which he was president in 1945-1946; the American Society of Mechanical Engineers; and the American Society of Tool Engineers.

Surviving are his wife and three children, his father, three brothers, and two sisters.

W. Gibson Carey, Jr.

W. Gibson Carey, Jr., for fifteen years president of the Yale & Towne Mfg. Co., with headquarters in New York City, was accidentally drowned at Ponte Vedra Beach, Florida, on October 4, aged fifty-one years. Mr. Carey had gone to Florida to attend the semi-annual meeting of the American Society of Sales Executives, and was swimming with his wife in the late afternoon, when a strong undertow in the ocean dragged him down.

Mr. Carey was born in Schenectady, N. Y., on July 3, 1896. He attended the Nott Terrance High School and subsequently took a liberal arts course at Union College. During World War I he enlisted in the Army and served in France with the 307th Field Artillery, advancing to the rank of captain before his honorable discharge. In 1919, he entered the paper and pulp business in New York as a salesman, at the same time taking night courses in accounting and business management at Columbia University. From 1923 to 1926 he was secretary and treasurer of the Philadelphia Paper Mfg. Co. In 1926, he became general manager of the Philadelphia Division of the Container Corporation of America.

He was elected a member of the board of directors of the Yale & Towne Mfg. Co. in 1929, and later in the same year joined the company as assistant to the president. From that post he advanced to the position of vice-president and treasurer, and in 1932 was elected president.

Known as one of the nation's leading industrialists, Mr. Carey had equal renown as a civic leader and philanthropist. In addition to participating in the first World War, he served in World War II as a colonel in the Army Specialist Corps, and later assisted the Defense Plant Corporation and other federal bodies organized to help win the war on the industrial production front. He is survived by his widow, a daughter and a son, and his brother.

Cecil W. Machon

Cecil W. Machon, general sales manager of the Brown & Sharpe Mfg. Co., Providence, R. I., died suddenly on October 11 at his home in North Providence, at the age of sixty-eight years. Mr. Machon was born in Murray Harbor, Prince Edward Island, in 1879, and moved to Providence with his family when he was eight years of age.

Mr. Machon entered the employ of the Brown & Sharpe Mfg. Co. in 1898, and was placed in charge of the cutter department office in 1907. He became sales manager of the small tools department in 1917, and general sales manager and assistant secretary of the company in 1941. He was president of the Brown & Sharpe Co. and Brown & Sharpe of New York, Inc., subsidiaries of the parent concern. During World War II, Mr. Machon served as a member of the War Production Board Advisory Committee on Milling Cutters and Form Tools.

He is survived by his wife, a son, and a daughter.

EDMUND H. TITCHENER, founder and president of E. H. Titchener & Co., Binghamton, N. Y., died on September 22 at the age of eighty-eight years. The Titchener company was originally organized to make wire staples, but in later years manufactured all kinds of wire-formed parts, strip steel parts, stampings, and assemblies. He is survived by his son, Paul F. Titchener, who is vice-president and general manager of the company.

* * *

Transfer Machine Moving Picture

Because of the interest in the adaptability of automatic transfer processing machines, Greenlee Brothers & Co., Rockford, Ill., has produced another sound motion picture describing the operations of four individual transfer units built to machine seventy-five automobile cylinder blocks per hour at 80 per cent efficiency.

This film was shown for the first time at the Machine Tool Show in Cleveland. It shows how the individual machine heads operate and how the work-pieces are transferred, rotated, positioned, clamped, and machined in a continuous automatic cycle. Prints of this 16-millimeter, fifteen-minute film are available on a loan basis to interested technical groups. Requests should be made to Greenlee Brothers & Co. on a company letter-head, stating the approximate date the film is desired and the estimated number of persons who will view the film.